COST BENEFIT ANALYSIS OF THE OKLAHOMA EXPANDED FOOD AND NUTRITION EDUCATION PROGRAM

By

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COST BENEFIT ANALYSIS OF THE OKLAHOMA

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TABLE OF CONTENTS

Chapter Page

LIST OF TABLES

CHAPTER I

INTRODUCTION

In 1968, the Senate Select Committee on Nutrition and Human Needs created the Expanded Food and Nutrition Education Program (EFNEP) as part of an effort to reduce malnutrition and hunger among approximately 5.5 million families living in poverty (Chipman and Kendall, 1989). The defined goal of EFNEP was to help low-income families and youth acquire the knowledge, skills, attitudes and changed behavior necessary for nutritionally sound diets, and to contribute to their personal development and to the improvement of the total family diet and nutritional welfare (P.L., 97-98, Section 1423 [c]) (Chipman and Kendall, 1989).

As part of the United States Department of Agriculture's (USDA) Cooperative Extension Service (CES), EFNEP is currently the single largest federally funded nutrition education program in the United States. Trained paraprofessionals instruct low-income families on the importance of food, food groups, food storage and sanitation, food buying and preparation, best use of limited resources and community resources such as food stamps. Several studies with EFNEP participants have shown that nutrition education through EFNEP has helped participants improve their shopping, food preparation, and eating practices (Contento et al., 1995; Brown and Pestle, 1981; Amstutz and Dixon, 1986; Arnold and Sobal, 2000).

Although studies have shown EFNEP improves nutrition behaviors and practices of participants, there are few studies of cost effectiveness of the program. Burney (1998) conducted a cost benefit analysis to determine if participation in EFNEP helped households use their food resources wisely and how much it cost to change food resource management practices. The result of the study was a net present value of $600.52 related to savings in food expenditures.

In 1996, the Virginia Cooperative Extension (VCE) Service received a grant from the USDA to conduct a cost-benefit analysis. Cost benefit analysis (CBA) is one economic evaluation strategy that assists public policy decision-making. CBA attempts to weigh all the impacts of a program to assess whether it is worthwhile, or whether its benefits exceed its costs (Clemmer et al., 1996). The VCE released their results from the CBA in 1999. The Virginia EFNEP had an initial benefit cost ratio of $10.64/$1.00 (Lambur et al., 1999). In order to validate the use of cost-benefit analysis as an effective method of evaluating the economic impacts of EFNEP, it is necessary for other states to replicate the study.

Statement of the Problem

Dietary habits have been linked to the prevention and treatment of several diseases. If positive dietary behavior changes are made, a decrease in the incidence of the diseases will occur. Furthermore, if a decrease in the incidence of disease occurs, there will be a decrease in the cost of disease on society.

Therefore, it is important to evaluate the economic value of federally funded programs such as EFNEP. The problem is that the Cooperative Extension Service has no data to estimate the net economic benefit of the Oklahoma Expanded Food and Nutrition Education Program.

Purpose and Objectives

The purpose of this study was to estimate the economic benefit of the Oklahoma Expanded Food and Nutrition Education Program (OK EFNEP). The objectives of the study were:

1. to estimate the number of OK EFNEP graduates practicing optimal nutrition behaviors using data provided by EFNEP.
2. to verify the selection of optimal nutrition behaviors for nine conditions (heart disease, stroke and hypertension, cancer, obesity, diabetes, osteoporosis, foodborne illness, low birth weight infants) based on a review of current literature.
3. to estimate direct tangible benefits of OK EFNEP based on a review of current literature.
4. to estimate indirect tangible benefits based on a review of current literature.
5. to conduct a cost benefit analysis of OK EFNEP.
6. to conduct sensitivity analysis for benefits using computer modeling.

Definition of Terms

Benefit cost ratio- benefits obtained per dollar of cost (Lambur et al., 1999).

Benefits- positive outcomes resulting from the intervention or program.

Cost benefit analysis (CBA)- a method of estimating the net benefits of a program in monetary terms.

Costs- value of resources used to produce a good or service.

Direct benefits- positive outcomes of the program that participants or others directly involved in the program receive. Includes delaying or avoiding a disease/condition through behaviors taught and measured in EFNEP.

Direct costs- resources budgeted to the program. Examples include personnel, facilities, equipment, materials and other costs.

Discount rate- rate used to relate present and future dollars. Expressed as a percentage and used to reduce the value of future dollars in relation to present dollars to account for the time value of money (Department of Veterans Affairs, 1989).

Indirect benefits- secondary outcomes of the program. Includes delaying or avoiding the loss of wages from work due to lost workdays because of disease.

Indirect costs- resources not budgeted to the program. Examples include time lost from work, child-care costs, and increased expenditures for food and medications.

Intangible benefits- benefits that cannot be easily monetized. Examples include knowledge gained, attitudes changed, skills acquired, practices adopted, and individual and societal end results.

Internal rate of return- social discount rate that would make the costs and benefits equal over the life of the program (Lambur et al., 1999).

Net present value- discounts all the future yearly net benefits and sums them to arrive at a value that reflects all future net benefits in today's dollars (Lambur et al., 1999).

Paraprofessional/Nutrition Education Assistant (NEA)- trained by the Cooperative Extension Service (CES) to teach nutrition skills, indigenous to the EFNEP population (Torisky et al., 1989).

Type A diseases/conditions (colorectal cancer, heart disease, stroke)- diseases or conditions that are considered to be life threatening (Lambur et al., 1999).

Type B diseases/conditions (hypertension, osteoporosis, Type 2 diabetes, obesity, food borne illness)- diseases or conditions not considered to be life threatening (Lambur et al., 1999).

Type C diseases/conditions (low-birth-weight infants)- treatment costs are incurred on a one-time basis (Lambur et al., 1999).

CHAPTER II

REVIEW OF LITERATURE

In order to perform a cost benefit analysis, it is important to understand the process of CBA; the EFNEP program and its costs; and the incidence, cost and optimal nutrition behaviors for the specified diseases/conditions.

Cost Benefit Analysis

Clemmer et al. (1996) reviewed the background of CBA as a technique to assist public policy decision-making. Jules Dupuit first used CBA in 1844 in the essay "On the Measurement of the Utility of Public Works". In the United States, CBA began in 1936 when Congress proposed the United States Flood Control Act of 1936 that stated that the benefits of federal projects should exceed the costs. CBA has since been used as a policy tool by the federal government.

Shi and Singh (1998) stated that CBA is based on four main assumptions: the problem or health condition can be identified or measured, the problem can be controlled or eradicated using an appropriate intervention, the benefit or outcome can be assigned a dollar value, and the cost of intervention can be determined in dollar terms. The main barrier to CBA is the difficulty in putting a dollar value on human life. According to Robinson (1993), the attachment of monetary values to outcomes makes it possible to say whether a program offers an overall net gain to society if the overall benefit exceeds the costs.

According to Robinson (1993), two different approaches are used to apply cost-benefit analysis: the human capital approach and the willingness to pay method. The human capital approach is based on the idea that human beings are similar to capital equipment in that they are expected to yield a flow of productive activity in future years. Assuming that the activity is equal to the individuals rate of pay, then the benefits of health care can be measured in terms of the future income that a person would accrue as long as they delay or avoid disease5. The willingness to pay method attempts to establish the value individuals attach to health care outcomes by asking them how much they would be willing to pay to avoid the cost of illness. The use of the willingness to pay method is relatively rare in health care studies. The human capital approach was used for the present study.

There are three methods of calculating cost benefit results. The benefit-cost ratio is the benefits of the program divided by its costs. If the ratio is greater than one, then the benefits exceed the costs and the program is considered acceptable (Clemmer et al., 1996). The net present value (NPV), or overall benefits of the program, is the overall program efficiency. A NPV greater than zero is desired (Clemmer et al., 1996). The higher the NPV, the more cost-effective a project is considered (Sassone and Schaeffer, 1978). The last calculation method, the internal rate of return (IRR), is the rate of discounting the future that equals the initial cost and the sum of the future discounted net benefits. This method is regarded as inferior to the net present value method

(Sassone and Schaefer, 1978). For the present study, the benefit-cost ratio and net present value methods were used.

Cost benefit studies of federally funded nutrition programs show that the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) has decreased newborn medical costs through prenatal nutrition education. Buescher et al. (1993) performed a cost benefit analysis of WIC participation in North Carolina. The study measured the impact of prenatal participation in WIC on low birth weight and Medicaid costs for newborn medical care. The study estimated that for every $1.00 spent on WIC services a Medicaid savings of $2.91 in newborn medical costs. The greater the level of participation in WIC the greater the cost savings and better birth outcomes. This study demonstrated that prenatal nutrition education through WIC can effectively reduce low birth weight infants and reduce newborn medical costs.

Montgomery and Splett (1997) determined whether an economic benefit of breast feeding infants enrolled in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) was associated with a reduction in Medicaid expenditures during the first six months of life. The benefit-cost study compared breast-feeding to formula feeding in Colorado based on actual WIC costs for mothers and infants and Medicaid expenditures for infants. The breast feeding infants saved $478 in WIC costs and $112 per infant in Medicaid cost. This study showed that breast feeding is not only beneficial nutritionally, but is also economically advantageous.

Expanded Food and Nutrition Education Program

Chipman and Kendall (1989) described the typical EFNEP participant and method of education. Historically, EFNEP enrollees were homemakers from the poorest sector of society, from a minority background, with limited education, and were considered culturally, socially and geographically isolated. Studies show that enrollees now appear to be the "new poor", more self-motivated than traditional homemakers, having been recently unemployed and having applied for public assistance. The "new poor" tends to be Caucasian, better educated, have a family structure, and be less likely to drop out of the program than the traditional homemaker.

When EFNEP began, one-to-one instruction was the only teaching method. Due to cost constraints, EFNEP began teaching small groups. Small groups have many advantages such as larger caseloads per paraprofessional, lower lesson cost per individual, and increased numbers of graduates (Chipman and Kendall, 1989).

The 24-hour food recall is used to monitor the dietary intake of homemakers (Chipman and Kendall, 1989). The food recall has many advantages and limitations. Two of the most important limitations are errors caused by poor memory or estimation and the tendency of subjects to attempt to report what they 'should' have eaten. The small amount of time and participation required to administer the recall are the advantages (Del Tredici et al., 1988).

The Food Practice Checklist (FPC) measures the impact EFNEP has on dietary behaviors and practices. The FPC has been evaluated to ensure that it is

a valid method of measuring dietary practices. Bowens et al. (1995) determined that the FPC had content and face validity and it was responsive and culturally sensitive in assessing food practice changes. Townsend et al. (1999) reexamined the FPC for six criteria to develop a short checklist that is a valuable evaluation tool. Six criteria were used to evaluate the validity of the checklist: criterion validity using serum carotenoids, criterion validity using the means of three recalls, test-retest validity, validity by race, lack of baseline differences by race, and sensitivity to detect change. Nine items on the checklist met the specific criteria and 12 items met the criteria in 'race specific' cases. The final conclusion was that a valid and reliable short checklist is available as an evaluation tool for both whites and African Americans.

Oklahoma EFNEP

Nutrition education is provided to EFNEP participants weekly. Education lessons are delivered as one-to-one home visits, small neighborhood groups, and preformed groups. General nutrition education is provided along with various lesson topics that participants can select that are related to their individual interests and family needs. Lesson topics cover food budgeting, meal planning and shopping, meal preparation skills, and food safety.

Participants who enroll in EFNEP have two options: a long-term program and a short-term program. The long-term program provides an in-depth education for families wanting to improve their health. To graduate from the long-term program, the families must complete six to eleven months of

participation, complete a minimum of 16 lesson topics, and improve in two areas of the food recall and two behaviors of the food practice checklist. The short-term program is a focused intense education that provides survival skills to meet specific nutrition and resource management needs. Completion of the short-term program requires two to five months of participation; completion of Food Guide Pyramid, Label Reading, Budgeting, Meal Planning, and Food Safety lesson topics; and completion of one of the following lesson topics: Feeding Young Children, Breakfast, or Healthy Snacks. Participants are given an entrance and exit 24-hour dietary recall and food practice checklist to access their dietary behaviors (Oklahoma Cooperative Extension Service, 1999)

Optimal Diet Behaviors and Costs of Diseases/Conditions

Heart Disease

Based on information from the National Health and Nutrition Examination Survey III (NHANES III), the American Heart Association (AHA) stated that 12,000,000 Americans have coronary heart disease (CHD), 7,000,000 have experienced a myocardial infarction, and 6,200,000 have angina pectoris (AHA, 1998). According to current estimates from the 1996 National Health Interview Survey (United State Department of Health and Human Services, 1999), the prevalence of CHD in the low-income population was 12.87%. The National Cholesterol Education Program reported in the Adult Treatment Panel II (1993) that age is a risk factor for developing CHD in relationship to gender. For males,

greater than 45 years of age is considered an increased risk and for females the age is greater than 55 years. The average length of survival after developing heart disease is 10 years (Medical Services, 1999).

The AHA estimated the total cost of CHD to be $99.8 billion in 1999. Direct costs of CHD, including the cost of physicians and other health professionals, hospital and nursing home services, cost of medications, home health and other medical durables, accounted for $53.1 billion. Indirect costs, totaling $46.7 billion, include lost productivity resulting from morbidity and mortality (AHA, 1998). The estimated cost of CHD per patient per year equals $3,960. According to the Bureau of Labor Statistics (1995), the average number of lost workdays due to heart disease was 58.

The United States Department of Health and Human Services Office of Disease Prevention and Health Promotion (1997) recommended the following dietary changes to prevent heart disease: Reduce dietary fat intake to an average of 30 percent of calories or less and average saturated fat intake to less than 10 percent of calories among people aged 2 and older. Dietary data from the 1976-80 NHANES II indicated that for people aged 2 and older 36 percent of calories came from total fat and 13 percent of calories came from saturated fat. The 1989-91 Continuing Survey of Food Intakes by Individuals (CSFII) estimated that Americans consumed 34 percent of calories from total fat and 12 percent from saturated fat. Another recommendation is to increase to at least 50 percent the proportion of people aged 2 and older who meet the Dietary Guidelines' average daily goal of no more than 30 percent of calories from fat, and to

increase to at least 50 percent the proportion of people aged 2 and older who meet the average daily goal of less than 10 percent of calories from saturated fat. Dietary data from the 1988-94 NHANES III indicated that 27 percent of Americans met the goal for fat and 29 percent met the goal for saturated fat. The 1989-91 CSFII estimated that 22 percent met the goal for fat and 21 percent met the goal for saturated fat.

According to McGinnis and Foege (1993) 23-30% of CHD deaths can be attributed to dietary factors. Krauss et al. (1996) concluded that Americans could improve their overall health and reduce the incidence of coronary heart disease by adopting diet changes. The American Heart Association issued seven policy statements on diet and CHD: eat a variety of foods; balance food intake with physical activity and maintain or reduce weight; choose a diet with no more than 30% of calories from total fat, less than 10% of total fat calories from saturated fatty acids, and less than 300 mg/d of cholesterol; choose a diet with plenty of vegetables, fruits. and whole-grain products; choose a diet moderate in sugar; use salt and sodium in moderation; and if you drink, do so in moderation.

Stroke

The American Heart Association (1998), based on data from the NHANES III 1988-94, reported that 4,400,000 Americans have suffered a stroke. The prevalence in the low-income population was estimated to be 2.65% (United States Department of Health and Human Services, 1999). The incidence of

stroke more than doubles after the age of 55 in each successive decade and more than half of stroke victims die within 8 years (AHA, 1998).

Medical costs for stroke victims range from $8,000 to $30,000 (Lyden, 1996). For this study, the average cost of $18,433.40 was used. According to the Bureau of Labor Statistics (1995), the average number of lost workdays due to stroke was 60.

The United States Department of Health and Human Services Office of Disease Prevention and Health Promotion (1997) recommended the same dietary intake as heart disease to prevent the occurrence of stroke.

According to The Merck Manual (Merck Research Laboratories, 1992), most cerebral vascular accidents occur secondary to atheroslerosis, hypertension, or both. For this study, the same percentage, 23-30%, as CHD will be used to relate the incidence of stroke related to dietary behaviors.

Hypertension

Amin et al. (1999) reported that 48 million Americans have hypertension based on data from NHANES III (1988-94). The prevalence in the low-income population was 38.7% (United States Department of Health and Human Services, 1999). The total cost of hypertension was estimated to total $33.3 billion annually, with direct costs totaling $24.5 billion, and indirect costs totaling $8.8 billion in 1999. The cost of treatment of hypertension per patient per year was about $694 (AHA, 1998). An average of 41 days of work were missed due to hypertension (Bureau of Labor Statistics, 1995).

The United States Department of Health and Human Services Office of Disease Prevention and Health Promotion (1997) recommended decreasing hypertension by decreasing salt and sodium intake so at least 65 percent of home meal preparers prepare foods without adding salt, at least 80 percent of people avoid using salt at the table, and at least 40 percent of adults regularly purchase foods modified or lower in sodium. In the 1989-90 CSFII 43 percent of main meal preparers did not use salt in food preparation, and 60 percent of individuals never or rarely used salt at the table in the 1989-91 CSFII. In 1988 20 percent of all people aged 18 and older regularly purchased foods with reduced salt and sodium content.

The Family Blood Pressure Program (2000) estimated that 30% of differences in blood pressure are due to genetics. Lutz and Przytulski (1997) estimated that 50% of hypertension could be reduced by weight control. For the present study, 50% was used as the incidence of hypertension related to diet.

Cancer

In 1999 it was estimated that there would be 129,400 new cases of colorectal cancer and 56,600 deaths in the United States (National Cancer Institute, 2000). According to Landis et al. (1998) 5.8% of the population will develop colorectal cancer. Colorectal cancer incidence rates show little socioeconomic gradient in the United States (Schatzkin, 2000). The incidence of colorectal cancer increases significantly after the age of 50 (Oncology Channel,

2000). There is a 63% survival rate of five years for colorectal cancer (American Cancer Society, 1999).

The Centers for Disease Control and Prevention (1999) estimated that cancer costs $107 billion annually including health care expenditures and lost productivity from illness and death. Ten percent of new cancer cases are colorectal cancer (Landis et al., 1998). Therefore, 10% of the cost of cancer may be attributed to colorectal cancer. After initial treatment, the average number of days in the hospital for colorectal cancer patients is 8.8 (Mushinski, 1998).

The United States Department of Health and Human Services Office of Disease Prevention and Health Promotion (1997) recommended the following diet changes to reduce the risk of cancer: increase complex carbohydrate and fiber-containing foods in the diets of people aged 2 and older to an average of 5 or more daily servings for vegetables (including legumes) and fruits, and 6 or more daily servings for grain products. Dietary data from the 1989-91 CSFII showed an average intake of 4.1 servings of vegetables and fruits and 5.8 servings of grain products for people aged 2 and older. Another goal was to increase to at least 50 percent the proportion of people aged 2 and older who meet the Dietary Guidelines' average daily goal of 5 or more servings of vegetables/fruits, and to increase to at least 50 percent the proportion who meet the goal of 6 or more servings of grain products. According to the 1989-91 CSFII 29 percent met the goal for fruits and vegetables and 40 percent met the goal for grain products.

The American Cancer Society (1999) identified dietary habits that increased the risk for developing colorectal cancer. A diet high in animal fats is thought to increase the risk for developing colorectal cancer while a diet high in vegetables and fruits is considered protective. According to Doll and Peto (1981) 35% of cancer deaths can be attributed to dietary behaviors.

Obesity

According to the National Institutes of Health's First Federal Obesity Clinical Guidelines developed by the National Heart, Lung, and Blood Institute and the National Institute of Diabetes and Digestive and Kidney Disease (National Institutes of Health, 1998), 97 million Americans are obese. The prevalence of obesity in the low-income population was 31% of men and 46% of women in 1988-1994 (National Center for Health Statistics, 1998). Obesity leads to an increased risk for hypertension, lipid disorders, type 2 diabetes, coronary heart disease, stroke, gallbladder disease, osteoarthritis, sleep apnea and respiratory problems. The total cost of obesity-related disease was estimated to be $100 billion annually (National Institutes of Health, 1998). An average of 1.83 work days were lost due to obesity (Wolf and Colditz, 1998).

According to the Guide to Clinical Preventive Services (United States Preventive Task Force, 1996), obesity is caused by an energy imbalance. To prevent obesity, it is necessary to keep energy intake balanced with daily energy expenditures. Obesity can be attributed to increased energy intake, inactivity, and genetics. According to Romsos (1996) 33% of obesity can be attributed to

genetics. Therefore, estimating that activity and diet contribute equally to the incidence of obesity, the incidence of obesity related to diet for this study was estimated to be 33%.

Diabetes

The American Diabetes Association (ADA) (1999) stated that 15.7 million people or 5.9% of the population have diabetes. The figure includes 10.3 million diagnosed cases and 5.4 million people who are unaware that they have diabetes. The prevalence of diabetes in the low-income population was estimated to be 8.0% (United States Department of Health and Human Services, 1999).

The estimated total annual cost of diabetes was $98 billion in 1997: $44.1 billion direct medical and treatment costs and $54 billion indirect costs attributed to disability and mortality (ADA, 1999). The cost of treatment of diabetes per patient per year equaled $6,242 in 1997. Adults with diabetes missed an average of 8.3 days of work (ADA, 1999).

Franz and Bantle (1999) stated that the Dietary Guidelines for Americans and the USDA Food Guide Pyramid should serve as the basis for achieving and maintaining good health for people with type 2 diabetes. Furthermore, they should receive basic nutrition education with emphasis on the benefits of fruits and vegetables and whole-grain carbohydrate sources and on the moderate use of animal fats and sugars. According to the Dietary Guidelines for Americans (USDA, 2000), Americans should choose a variety of grains daily, especially whole grains and choose a variety of fruits and vegetables daily.

Williams and Pickup (1999) stated that 33% of diabetes is related to genetics. According to the American Diabetes Association (1994) 80% of diabetics are obese. For this study, 67% will be used as the incidence of diabetes related to dietary behaviors.

Osteoporosis

The National Osteoporosis Foundation (NOF) (1999A) stated that 10 million Americans have osteoporosis, and 18 million people have low bone mass. The annual cost of osteoporosis was $13.8 billion. According to Barafield (1996), the treatment cost of osteoporosis per patient per year was $11,582 in 1995.

In order to prevent the onset of osteoporosis, a person should have an intake of 1000-1300 mg of calcium and 400-800 IU of Vitamin D per day (NOF, 1999B). Studies have shown that 40% to 60% of osteoporosis can be prevented by increasing calcium intake (Barafield, 1996).

Foodborne Illness

According to the Food and Consumers Economic Division of the USDA (1996), there are an estimated 6.5 to 33 million cases of foodborne illness per year. The cost of foodborne illness is estimated to be $9.3 to $12.9 billion annually. The average number of lost workdays due to foodborne illness was one (Bureau of Labor Statistics, 1995). The cost per patient per year was $1,429.

Foodborne illness can be prevented with proper food handling, thawing, and cooking procedures. One hundred percent of foodborne illness can be attributed to dietary behaviors.

Low Birth Weight Infants

The prevalence of low birth weight infants in the low-income population was 5.3% to 9.0% (Federation of American Societies for Experimental Biology, 1995). Low-weight births are defined as births with a weight of 5 lb. 8 oz (2500 gm) or less. Rogowski (1998) stated that each pregnancy that results in a normal birth instead of a low birth weight baby saves $59,700 in the first year of medical expenses.

The United States Department of Health and Human Services Office of Disease Prevention and Health Promotion (1997) recommended that at least 85 percent of mothers should achieve the minimum recommended weight gain during their pregnancies. In 1980, 68 percent of married women gained the recommended amount of weight.

The Institute of Medicine (1990) recommended that pregnant women increase their energy intake by 200 to 300 calories per day. Energy is the major nutrient that determines gestational weight gain. The extra energy required during pregnancy is for growth and maintenance of the fetus, placenta, and maternal tissues.

Lightwood et al. (1999) reported that about 10% of low birth weight infants are caused by maternal smoking. Therefore, for this study, 90% of low birth weight infants were attributed to inadequate maternal dietary behaviors.

Summary

The purpose of this study was to determine the economic benefit of the Oklahoma Expanded Food and Nutrition Education Program. In order to do this, monetary benefits had to be applied to the outcomes of the program. By determining the prevalence of disease/conditions in the low income population, the costs of disease/condition, and the incidence of disease related to diet, a dollar value was placed on the outcome of the program. Optimal nutrition behaviors were identified as those behaviors that have been proven to delay or prevent the onset or progression of diseases/conditions. Identifying the optimal nutrition behaviors for each disease/condition and applying a dollar value on the outcome of EFNEP, the economic benefit of EFNEP was determined.

CHAPTER III

METHODOLOGY

The following steps were taken to perform the CBA: 1) determined the prevalence of the disease/condition, costs of the disease, and incidence of the disease/condition related to diet, 2) identified the number of EFNEP graduates in Oklahoma for the 1998-99 fiscal year, 3) identified the optimal nutrition behaviors (ONB) for each disease/condition, 4) determined the number of graduates practicing and showing improvements in ONB, 5) monetized the direct and indirect benefits, 6) monetized the EFNEP costs, 7) calculated the CBA results, and 8) performed sensitivity analyses.

Step 1: Determine prevalence of disease/condition, costs of disease, and incidence of disease/condition related to diet

A review of literature was conducted to determine the prevalence of diseases in the low-income population (or the U.S. adult population if estimates for low-income adults were not available), costs of disease, and incidence of the disease/condition related to diet. For this study, the prevalence or incidence of the disease/condition was expressed as the prevalence per 100 persons.

Disease costs were expressed as cost per patient per year. To determine this, the estimated annual cost of the disease was determined from the literature and divided by the number of people with the disease for that year. Because some costs reported were not 1999 costs, the figures were adjusted to reflect

inflation. This was done using the gross domestic product (GDP) deflator index (Budget of the United States Government, 2000) (see Appendix A). To adjust past costs, the GDP deflator for the year the cost was reported was divided by the 1999 GDP deflator and then multiplied by the cost of the disease.

Step 2: Identify the number of EFNEP graduates for the 1998-99 fiscal year

EFNEP participants provide an entrance and exit 24-hour food recall and food practice checklist (FPC) (see Appendix B). The data was entered into the EFNEP evaluation software, ERS4. Developed exclusively for EFNEP, ERS4 contains a database of foods. The nutrient information of the foods was developed from the database used by the USDA for the Nationwide Food Consumption Survey and the Agricultural Handbook #8 Nutrient Content of Foods (EFNEP, 1998).

ERS4 data from each unit was provided by EFNEP. Files containing demographic data, FPC, and 24-hour dietary recall data were imported into the Statistical Package for the Social Science 9.0 (SPSS) for Windows (SPSS, 1999). The files for each unit were merged and then all units were merged into one large file. Detailed methods for this procedure are located in Appendix C. Only graduates completing an entrance and exit FPC and 24-hour dietary recall during the 1998-99 fiscal year were eligible to be used in this study.

Step 3: Identify optimal nutrition behavior for each disease/condition measured by EFNEP

During the 24-hour dietary recall, participants indicate the type and number of servings of food they have eaten in the past 24 hours and the time of day the food was eaten. Nutrient intake was estimated by the ERS4 database of foods. The FPC questions measure food related behaviors and food handling practices on a scale of 1 - 5 where 1= do not do, 2= seldom, 3= sometimes, 4= most of the time, and 5= almost always. From a review of current literature, optimal nutrition behaviors (ONB) for each disease/condition were determined. Optimal nutrition behaviors are dietary practices that have been shown to delay or stop the progression of the disease/condition.

Step 4: Determine number of graduates practicing and improving optimal nutrition behaviors

Selection of graduates practicing ONB was determined by analyzing ONB criteria on the exit and entry FPC and 24-hour dietary recalls. Upon exit, participants must have scored a 4 or greater where a positive response was desired, or a 2 or less where a negative response was desired on the FPC and met the 24-hour recall ONB nutrient criteria to have been considered a graduate who was practicing ONB (see Table 3.1). Participants must have shown improvement from entry to be considered a graduate; therefore, any graduate who met the ONB criteria for the disease/condition at entry was not eligible. Because these graduates were already practicing ONB for the disease/condition

at entry, it could not be inferred that these participants gained benefit from EFNEP.

Graduates were determined by analyzing the provided data in SPSS. Condition statements were used to extract the participants practicing ONB at exit but not at entry (see Appendix C for detailed methods). The number of graduates practicing ONB was then divided by the total number of graduates to calculate the percentage of graduates practicing optimal nutrition behaviors for the disease/condition. The percentage of graduates practicing optimal nutrition behaviors was used for the first cost benefit analysis.

After reviewing the Virginia Cooperative Extension CBA (Lambur et al., 1999) and the initial results of this study, the decision was made to determine the number of graduates showing improvements in the ONB. Even though these graduates may not be meeting all the strict ONB guidelines, if they have shown improvement in the ONB, then they have gained benefits from participating in EFNEP. A second CBA was conducted for the graduates showing improvements.

Improvements were calculated by taking the difference between participants' entry and exit responses on the FPC and differences in nutrient intake. Graduates had to show improvements in all FPC questions and recall criteria in order to be considered a graduate showing improvements (see Table 3.1). Improvement levels were determined by reviewing literature. For example, according to Nicklas et al. (1998) there was a significant increase in the daily consumption of fruits and vegetables after an intervention to increase high school

students' fruit consumption. The students increased their servings from 2.63 at baseline to 3.00 servings.

To determine the number of graduates showing improvements, the difference between entry and exit was transformed into a new variable, the change score. Data was analyzed in SPSS using condition statements to determine the number of graduates showing improvements in optimal nutrition behaviors between entry and exit (see appendix C for detailed methods). The number of graduates showing improvements in ONB was divided by the total number of graduates to determine the percentage of graduates showing improvements in ONB for the disease/condition.

Step 5: Monetize direct and indirect benefits

Tangible benefits to graduates were characterized in two ways: the benefit of avoiding or delaying the health care costs associated with treating nutrition-related disease/conditions, and the benefit of avoiding or delaying the loss of productivity from morbidity. These estimates were based on national data from a review of literature. All benefits included in this study were tangible benefits. Tangible benefits are those that can be monetized. In other words, a dollar value can be applied to them. Intangible benefits, such as knowledge gained, attitudes changed, skills acquired, and practices adopted were not included because they are not as easily monetized. These values were not assigned a dollar value for this study.

Before calculating direct and indirect benefits for each disease/condition, the present value of the benefits were calculated. The present value of benefits tells the value today of some future payment (Matulich and Heitger, 1985), discounted to today's dollars. According to Splett (1996), discounting future costs and outcomes converts them to a 'present value'. Discounting was performed for two reasons: inflation reduces the value of a dollar over time and economists prefer to have outcomes and benefits reflect present dollar value. The discount value used in CBA studies ranges between 2% to 10%, with 5% the most common (Splett, 1996).

In order to calculate the present value of benefits, the disease/conditions were separated into three categories or types. Different approaches were taken when calculating the present value of benefits for each disease/condition type.

Type A: heart disease, stroke, colorectal cancer

These diseases/conditions are considered to be life threatening. When calculating these benefits, it was assumed that the disease/condition onset could be delayed by practicing appropriate dietary behaviors. By delaying the onset of the disease/condition, the direct benefit is the present value of delaying the cost of treatment into the future. To calculate this, the annual discounted treatment costs were summed beginning with the average age of onset of disease through the average number of years of survival after treatment. Indirect benefits were calculated as the difference in the present value of morbidity costs beginning with the average age of onset of disease and the present value of delaying morbidity

costs into the future. A five-year time period was estimated as the length of time each Type A disease/condition would be delayed by practicing ONB (Lambur et al., 1999).

The following formula was used to calculate the direct present value of benefits for Type A disease/conditions:

Direct present value = $\sum_{t1}^{T} \frac{Benefits}{(1 \oplus r)^{t1}} - \sum_{t2}^{T} \frac{Benefits}{(1 \oplus r)^{t2}}$

r= discount rate
t^1= time period (average age of onset- average age of participant)
t^2= time period (age delayed – average age of onset)
T= time frame

Example: Heart disease

Average age of onset: 55
Average age of EFNEP participant: 28
Average years of survival after treatment: 10 years
Adjusted cost: $3,960.00

$$\frac{\$3,960.00}{(1.05)^{27}} + \ldots + \frac{\$3,960.00}{(1.05)^{36}} - \frac{\$3,960.00}{(1.05)^{32}} + \ldots + \frac{\$3,960.00}{(1.05)^{41}}$$

Direct present value = $8,599.68 - $6,738.15 = $1,861.15

See Appendix D for direct present value calculations for all Type A diseases.

The following formula was used to calculate the indirect present value of benefits for Type A diseases/conditions:

Indirect present value = $\sum_{t1}^{T} \frac{Morbidity\ costs}{(1 \oplus r)^{t1}} - \sum_{t2}^{T} \frac{Morbidity\ costs}{(1 \oplus r)^{t2}}$

r= discount rate
t^1= time period (average age of onset- average age of participant)
t^2= time period (age delayed – average age of onset)
T= time frame

Morbidity costs = 8 hr x number of lost work days x wage rate x number of years of survival after treatment

Example: Heart disease

Average age of onset: 55
Average age of EFNEP participant: 28
Number of years of survival after treatment: 10 years
Wage rate: $5.58 (Food and Nutrition Services, 2000)
Number of lost workdays: 58
Morbidity cost = $25,891.20

$$\frac{\$25,891.20}{(1.05)^{27}} + \ldots + \frac{\$25,891.20}{(1.05)^{36}} - \frac{\$25,891.20}{(1.05)^{32}} + \ldots + \frac{\$25,891.20}{(1.05)^{41}}$$

Indirect present value = $56,227.04 - $44,055.36 = $12,171.68

See Appendix D for indirect present value calculations for all Type A diseases.

Type B: hypertension, obesity, type 2 diabetes, osteoporosis, foodborne illness

These disease/conditions are not considered life threatening. When calculating the present value of benefits for Type B diseases/conditions, it was assumed that treatment costs could be avoided by practicing appropriate dietary behaviors. Based on this assumption, the direct benefit for these diseases/conditions was calculated as the present value of avoided treatment

costs from the average age of onset through the average life expectancy age, 79 years old (National Center for Health Statistics, 1999). Indirect benefits were calculated as the present value of morbidity costs avoided from the average age of onset through age 65, the average retirement age (Rix, 1999).

The following formula used to calculate the direct present value of benefits for Type B disease/conditions:

Direct present value = $\sum_{t}^{T} \frac{Benefits}{(1 \oplus r)^{t}}$

r= discount rate
t= time period (average age of onset – average age of participant)
T= time frame

40 - 28 = 12
79 - 40 = 39
39 + 12 = 51

Example: Type 2 Diabetes

Average age of onset: 40
Average age of EFNEP participant: 28
Adjust cost: $6,404

Direct present value = $\frac{6,404}{(1.05)^{12}} + \ldots + \frac{6,404}{(1.05)^{51}}$ = $64,248.55

See Appendix D for direct present value calculations for all Type B diseases/conditions.

The following formula was used to calculate the indirect present value of benefits for Type B disease/conditions:

$$\textbf{Indirect present value} = \sum_{t}^{T} \frac{Morbidity\,costs}{(1 \oplus r)^{t}}$$

r= discount rate
t= time period (average age of onset – average age of participant)
T= time frame

Example: Type 2 Diabetes

Average age of onset: 40
Average age of EFNEP participant: 28
Number of lost workdays: 8.3
Wages lost because of lost workdays: $370.51

$$\frac{\$370.51}{(1.05)^{12}} + \ldots + \frac{\$370.51}{(1.05)^{37}} = \$3{,}114.06$$

See Appendix D for indirect present value calculations for all Type B diseases/conditions.

Type C: Low birth weight infants

Treatment costs for this condition were considered a one time cost, when the infant was born. The direct benefit used was the present value of avoided treatment costs. Indirect benefits were not calculated on the basis that this was a one-time cost. This benefit was calculated using the pregnant participants of EFNEP. Therefore, the value was not discounted because the cost would have occurred less than one year after graduating from the program.

Formula for monetizing direct benefits

The following formula was used to derive the direct benefits from EFNEP for each disease/condition:

DIRECT BENEFIT = $A \times B \times C \times D \times E$

A= Annual number of graduates in EFNEP
B= Prevalence rate of the disease/condition in the low-income population
C= Incidence of the disease/condition related to diet
D= Percent of graduates practicing optimal nutritional behaviors related to avoiding or delaying the disease/condition
E= Present value of direct benefits for the disease/condition.

Example: Heart disease

A= 643
B= 12.9%
C= 26.5%
D= 0.5 %
E= $1,861.53

Direct benefit= 643 x 12.9% x 26.5% x 0.5% x $1,861.53
= $204.59

Formula for monetizing indirect benefits

The following formula was used to derive the indirect benefit from EFNEP for each disease/condition:

INDIRECT BENEFIT= $A \times B \times C \times D \times F$

A= Annual number of graduates in EFNEP
B= Prevalence rate of the disease/condition in the low-income population
C= Incidence of the disease/condition related to diet
D= Percent of graduates practicing optimal nutritional behaviors related to avoiding or delaying the disease/condition
F= Present value of indirect benefits for the disease/condition

Example: heart disease

A= 643
B= 12.9%
C= 26.5%
D= 0.5%
F= $12,171.68

Indirect benefit= 643 x 12.9% x 26.5% x 0.5% x $12,171.68
= $1,337.73

Step 6: Summarize EFNEP cost

The state EFNEP office determined all expenses, direct costs and in-kind costs, for the 1998-99 fiscal year. Direct costs included staff salaries, fringe benefits, travel, office supplies, educational supplies, other training costs and visual aids. These costs were obtained from the final fiscal year accounting printout of EFNEP expenditures at the state level. The total cost to the federal goverment for the 1998-1999 fiscal year was $82,624.72.

In-kind costs included office space used by EFNEP staff; prorated value of utilities, janitorial, maintenance on space; value of equipment used by EFNEP staff but not purchased by EFNEP funds; telephone and faxing; internet/electronic mail services; and computer and technology support. These costs were obtained from local Extension offices. The cost from the counties was $743,343.59.

After all cost figures were obtained, the total implementation costs of EFNEP for 1998-1999 was $825,968.31. Because EFNEP is funded by federal dollars, a marginal excess burden (MEB) of taxation was included in the CBA to ensure that the cost of administering EFNEP is not biased downward. The MEB that was used is 17%, the percent that is commonly used in the United States (Cox et al., 2000).

Step 7: Calculation of cost benefit results

Net Present Value (NPV)

The following formula was used to calculate the net present value: Program efficiency = Present value (PV) of total benefits – PV of total costs. The direct and indirect benefits of all benefits were summed together to determine present value of total benefits and then the total cost of the OK EFNEP was subtracted from the total benefits to calculate the net present value.

Benefit-Cost Ratio

The benefit-cost ratio for the 1998-1999 fiscal year was calculated by dividing the sum of all direct and indirect benefits by the total cost of the OK EFNEP.

Step 8: Sensitivity Analysis

Sensitivity analysis was conducted using computer modeling to account for uncertainties. Since a CBA is based on estimates and assumptions, it is necessary to conduct sensitivity analysis to determine which variables exerted the greatest influence and whether assumptions made in the analysis affected the final results (Clemmer et al., 1996 and Splett, 1996).

Retention rate of dietary behaviors

One assumption of this study was that EFNEP graduates would continue to practice the optimal nutrition behaviors the rest of their lives. If this is inaccurate. the benefits that were calculated will be overstated. Therefore, a sensitivity analysis was done by decreasing the retention rates of graduates practicing optimal nutrition behaviors by 50% and 75%.

The Discount Rate

A discount rate of 5% was used for the initial analysis of this study. However, when benefits accrue in the future using a low discount rate, the

programs may appear more beneficial (Clemmer et al., 1996). Therefore, sensitivity analysis was done by increasing the discount rate to 10%.

Hypotheses

1. The benefit-cost ratio of the Oklahoma EFNEP will be greater than $1.00 for graduates practicing optimal nutrition behaviors.

2. The benefit-cost ratio of the Oklahoma EFNEP will be greater than $1.00 for graduates showing improvements in optimal nutrition behaviors.

3. The net present value of the Oklahoma EFNEP will be greater than zero for graduates practicing optimal nutrition behaviors.

4. The net present value of the Oklahoma ENFEP will be greater than zero for graduates showing improvements in optimal nutrition behaviors.

Table 3.1. Criteria for optimal nutrition behaviors and improvements.

Disease/ Condition	FPC Question #	FPC Score		24-hour recall	
		Graduates	Improvements	Graduates	Improvements
Heart disease	7	≥ 4	> 0	Fat ≤ 30%	Fat ≤ -.05%
(1, 2)	8	≥ 4	> 0	Veg + fruit ≥ 5 s	Veg + fruit ≥ 1 s
	9	≥ 4	> 0	Bread ≥ 6 s	Bread ≥ 1 s
				Fiber ≥ 20 g	Fiber ≥ 2 g
Stroke (1)	7	≥ 4	> 0	Fat ≤ 30%	Fat ≤ -.05%
	8	≥ 4	> 0	Veg + fruit ≥ 5 s	Veg + fruit ≥ 1 s
	9	≥ 4	> 0	Bread ≥ 6 s	Bread ≥ 1 s
				Fiber ≥ 20 g	Fiber ≥ 2 g
Colorectal cancer	7	≥ 4	> 0	Fat ≤ 30%	Fat ≤ -.05%
(1, 3)	9	≥ 4	> 0	Veg + fruit ≥ 5 s	Veg + fruit ≥ 1 s
				Bread ≥ 6 s	Bread ≥ 1 s
				Fiber ≥ 20 g	Fiber ≥ 2 g
Hypertension (1)	7	≥ 4	> 0	Fat ≤ 30%	Fat ≤ -.05%
	8	≥ 4	> 0	Veg + fruit ≥ 5 s	Veg + fruit ≥ 1 s
	9	≥ 4	> 0	Bread ≥ 6 s	Bread ≥ 1 s
				Fiber ≥ 20 g	Fiber ≥ 2 g
Obesity (4)	7	≥ 4	> 0	Calories ≤ 2200	Calories ≤ -250
	9	≥ 4	> 0	Fat ≤ 30%	Fat ≤ -.05%
Type 2 Diabetes	7	≥ 4	> 0	Veg + fruit ≥ 5 s	Veg + fruit >= 1 s
(5, 6)	9	≥ 4	> 0	Bread ≥ 6 s	Bread ≥ 1 s
				Fiber ≥ 20 g	Fiber ≥ 2 g
Osteoporosis (7)	7	≥ 4	> 0	Dairy ≥ 2 s	Dairy ≥ 0.5 s
	9	≥ 4	> 0	Calcium ≥ 1000 mgs	Calcium ≥ 100 mgs
Foodborne Illness	5	≤ 2	< 0	-	-
	6	≤ 2	< 0		
LBW infants	7	≥ 4	> 0	Yes for pregnant	Yes for pregnant
(1, 8)	9	≥ 4	> 0	Calories ≥ 2500	Calories ≥ 300

s= serving, g= grams, mgs= milligrams

Reference List for Food/Nutrient Values for Table 3.1

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3. American Cancer Society. Cancer facts and figures 1999: Special section: colorectal cancer. Available at: http://www.cancer.org/statistics/cff99/special.htm. Accessed October 28, 1999.

4. U.S. Preventive Services Task Force. Guide to Clinical Preventive Services. 2nd Edition. Baltimore, MD: Williams and Wilkins; 1996.

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7. National Osteoporosis Foundation. Prevention: How can I prevent osteoporosis? Available at: http://ww.nof.org/prevention/prevention.htm. Accessed October 31, 1999.

8. Institute of Medicine. Nutrition During Pregnancy. Washington, DC: National Academy Press; 1990.

CHAPTER IV

RESULTS

EFNEP Graduates

During the 1998-1999 fiscal year, 689 participants graduated from EFNEP in Oklahoma. Due to errors in data entry and outliers, 37 participants were deleted. For this study, the number of graduates was 643. EFNEP is located in seven units across Oklahoma: Choctaw, Comanche, Oklahoma, Okmulgee, Pittsburg, Pontotoc, and Tulsa. All units except Comanche reported participants who entered and graduated during the 1998-99 fiscal year (see Table 4.1).

The average age of participants was 28.4 years. Graduates were predominately female, of white race, lived in a central city over 50,000 people, and received some kind of public assistance at entry. Table 4.2 contains complete graduate demographic information.

Table 4.1. EFNEP units graduates

Unit	N	%
Choctaw	64	10.0
Comanche	0	0.0
Oklahoma	149	23.2
Okmulgee	96	14.9
Pittsburg	76	11.8
Pontotoc	38	5.9
Tulsa	220	34.2

Table 4.2. Characteristics of EFNEP graduates

	Mean ± SD		
Age (yr)	28.4	±	9.8
Income ($ per month)	521.25	±	555.47
Other adults in household (n)	1.4	±	2.2
Family size (n)	4.0	±	2.5
Lessons completed (n)	17.9	±	7.5
Recalls completed (n)	2.2	±	0.5
Checklists completed (n)	2.0	±	0.1
Money spent on food ($ per month)	161.27	±	126.50
	n		**%**
Sex			
Female	608		94.6
Male	35		5.4
Race Code			
White (non-Hispanic)	374		58.2
Black (non-Hispanic)	131		20.4
American Indian/Alaskan Native	99		15.4
Hispanic	36		5.6
Asian or Pacific Islander	3		0.5
Town Size			
Farm	14		2.2
Town under 10,000 and rural non-farm	227		35.3
Town/ city 10,000 – 50,000	103		16.0
Suburb of city over 50,000	39		6.1
Central city over 50,000	260		40.4
Public Assistance Family Participates in at Entry			
WIC/CSFP[1]	310		48.2[2]
Food Stamps	225		35.0
FDPIR[3]	9		1.4
TEFAP (Commodities)[4]	21		3.3
Head Start	46		7.2
Child Nutrition	202		31.4
TANF[5]	108		16.8
Other	269		41.8

[1]Women, Infants, & Children/ Community Supplemental Food Program
[2]Column totals more than 100% because graduates could participate in more than one program
[3]Food Distribution Program on Indian Reservation
[4]Temporary Emergency Food Assistance Program
[5]Temporary Aid to Needy Families

Food Practice Checklist

Five questions from the FPC were analyzed for this study (see Table 4.3). Questions five and six ask about food safety. On question five, "This question is about meat and dairy foods. How often do you let these foods sit out for more than two hours?" most graduates answered "do not do" on both entry and exit. On question six, "How often do you thaw foods at room temperature?", most responses were "sometimes" or "most of the time" on entry. This improved at exit, where most answered "do not do".

Questions seven, eight, and nine ask about healthy eating behaviors. On question seven, "When deciding what to feed your family, how often do you think about healthy food choices?", most graduates answered "sometimes" or "most of the time" on entry. At exit, responses improved to "most of the time" or "almost all the time". On question eight, "How often have you prepared foods without adding salt?", graduates answered "do not do" and "seldom" the most on entry. On exit, more graduates replied "sometimes" than any other response. For question nine, "How often do you use the "Nutrition Facts" on the food label to make food choices?", most graduates responded "do not do" or "seldom". On exit, this improved to "sometimes" and "most of the time".

Table 4.3. Responses to the Food Practice Checklist questions

Food Practice Checklist question	Entrance		Exit	
	n	%	n	%
This question is about meat and dairy foods. How often do you let these foods sit out for more than two hours?				
No answer	20	3.1	12	1.9
Do not do	387	60.2	485	75.4
Seldom	122	19.0	108	16.8
Sometimes	95	14.8	35	5.4
Most of the time	14	2.2	2	0.3
Almost always	5	0.8	1	0.2
How often do you thaw frozen foods at room temperature?				
No answer	4	0.6	6	0.9
Do not do	123	19.1	342	53.2
Seldom	108	16.8	114	17.7
Sometimes	199	30.9	125	19.4
Most of the time	132	20.5	41	6.4
Almost always	77	12.0	15	2.3
When deciding what to feed your family, how often do you think about healthy food choices?				
No answer	6	0.9	1	0.2
Do not do	55	8.6	10	1.6
Seldom	79	12.3	39	6.1
Sometimes	218	33.9	143	22.2
Most of the time	197	30.6	275	42.8
Almost always	88	13.7	175	27.2
How often have you prepared foods without adding salt?				
No answer	14	2.2	8	1.2
Do not do	165	25.7	91	14.2
Seldom	167	26.0	126	19.6
Sometimes	156	24.3	211	32.8
Most of the time	75	11.7	136	21.2
Almost always	66	10.3	71	11.0
How often do you use the "Nutrition Facts" on the food label to make food choices?				
No answer	11	1.7	6	0.9
Do not do	228	35.5	46	7.2
Seldom	156	24.3	113	17.6
Sometimes	167	26.0	191	29.7
Most of the time	47	7.3	175	27.2
Almost always	34	5.3	112	17.4

24-Hour Dietary Recall

The difference between entry and exit recall data was taken to determine if graduates improved their eating habits. A paired t-test was done to determine if the change was significant. All food group servings and nutrients showed a significant difference ($p < 0.05$) between entry and exit except the number of bread servings. Table 4.4 shows entry, exit and difference means for the 24-hour dietary food recall.

Table 4.4. Changes in estimates of 24-hour dietary food recall

Food group or nutrient N= 643	Entrance Mean ± SD	Exit Mean ± SD	Difference Mean ± SD
Dairy (servings)	1.4 ± 1.4	1.8 ± 1.5	0.3 ± 1.8**
Vegetable (servings)	2.6 ± 2.4	3.2 ± 2.4	0.6 ± 3.2**
Bread (servings)	5.6 ± 3.1	5.8 ± 2.8	0.2 ± 3.8
Fruit (servings)	0.7 ± 1.3	1.4 ± 1.7	0.6 ± 1.8**
Energy (kcal)	1833 ± 774	1987 ± 780	153 ± 937**
Fat (g)	74.6 ± 38.4	78.9 ± 39.3	4.3 ± 50.0**
Fat (% kcal)	36.1 ± 8.2	35.3 ± 8.2	-0.8 ± 0.1*
Calcium (mg)	706 ± 441	835 ± 460	128 ± 545**
Fiber (g)	12.5 ± 9.7	14.6 ± 8.7	2.1 ± 12.1**
Vegetable + Fruit (svgs)	3.3 ± 2.8	4.5 ± 2.9	1.2 ± 3.8**

** significant at $p < 0.001$
* significant at $p < 0.05$

CBA Results

The initial CBA for graduates practicing optimal nutrition behaviors benefit cost ratio was $1.04/$1.00 and had a net present value of $39,811.24 (see Table 4.5). Graduates showing improvements had a benefit cost ratio of $1.25/$1.00 and a net present value of $241,140.67 (see Table 4.6).

Osteoporosis, foodborne illness, and type 2 diabetes provided the greatest direct benefits for graduates practicing optimal nutrition behaviors. These diseases had the greatest number of EFNEP graduates practicing optimal nutrition behaviors. Heart disease, stroke, and hypertension provided the least direct benefits because a low number of graduates practiced optimal nutrition behaviors. For graduates showing improvements, osteoporosis, type 2 diabetes, and low birth weight infants provided the greatest direct benefits. The number of graduates showing improvements for foodborne illness and obesity decreased from the number of graduates practicing the optimal nutrition behaviors. Because to be considered a graduate improving optimal nutrition behaviors, they had to improve each behavior. Therefore, if a graduate answered a 1 on the Food Practice Checklist question one, they would not be able to show improvement from entry to exit.

Hypertension, foodborne illness, and type 2 diabetes provided the greatest indirect benefits for graduates practicing optimal nutrition behaviors. Colorectal cancer, stroke and heart disease provided the least indirect benefits. For graduates showing improvements, hypertension, heart disease, and foodborne illness provided the greatest indirect benefits.

Sensitivity analyses of both graduates practicing optimal nutrition behaviors (see Appendices E, F, and G) and improving optimal nutrition behaviors (see Appendices H, I, and J) benefit cost ratios were less than $1.00 for all analyses. The net present value of all analyses was negative. Table 4.5 lists all benefit-cost ratios and net present values for all analyses.

Table 4.5. Initial EFNEP CBA of graduates practicing optimal nutrition behaviors

Direct tangible benefits	**Value**
Cardiovascular Disease	$186.15
Stroke	$145.07
Colorectal Cancer	$5,805.74
Hypertension	$2,297.63
Obesity	$48,554.00
Type 2 diabetes	$115,647.39
Osteoporosis	$494,284.32
Foodborne Illness	$222,218.15
Low birth weight infants	$96,531.10
Sub total direct tangible benefits	**$985,669.55**
Indirect tangible benefits	
Cardiovascular Disease	$1,217.17
Stroke	$168.63
Colorectal Cancer	$198.22
Hypertension	$4,271.92
Obesity	$2,974.76
Type 2 diabetes	$5,605.31
Foodborne Illness	$6,088.62
Sub total indirect tangible benefits	**$20,524.61**
Total benefits	**$1,006,194.16**
Direct costs	
Counties	$743,343.59
State	$82,624.72
Marginal excess burden	$140,414.61
Total costs	**$966,382.92**
Benefit cost ratio	**$1.04/$1.00**
Net present value	**$39,811.24**

Direct benefits for graduates practicing optimal nutrition behaviors

Disease/condition: Heart disease (Type A)	
Annual number of graduates in EFNEP	643
Prevalence of heart disease in the population	12.9%
Incidence rate of heart disease related to diet	26.5%
Percent of graduates practicing optimal nutritional behaviors related to heart disease	0.5%
Estimated number of graduates to accrue benefits	0.1
Present value of the benefits related to heart disease	$1,861.53
Total direct benefit of delaying heart disease	**$186.15**

Disease/condition: Stroke (Type A)	
Annual number of graduates in EFNEP	643
Prevalence of stroke in the population	2.7%
Incidence rate of stroke related to diet	26.5%
Percent of graduates practicing optimal nutritional behaviors related to stroke	0.5%
Estimated number of graduates to accrue benefits	0.02
Present value of the benefits related to stroke	$7,253.33
Total direct benefit of delaying stroke	**$145.07**

Disease/condition: Colorectal Cancer (Type A)	
Annual number of graduates in EFNEP	643
Incidence rate of colorectal cancer in the population	5.8%
Incidence rate of colorectal cancer related to diet	35%
Percent of graduates practicing optimal nutritional behaviors related to colorectal cancer	2.0%
Estimated number of graduates to accrue benefits	0.3
Present value of the benefits related to colorectal cancer	$19,352.48
Total direct benefit of delaying colorectal cancer	**$5,805.74**

Direct benefits for graduates practicing optimal nutrition behaviors, continued

Disease/condition: Hypertension (Type B)	
Annual number of graduates in EFNEP	643
Prevalence rate of hypertension in the population	38.7%
Incidence rate of hypertension related to diet	50%
Percent of graduates practicing optimal nutritional behaviors related to hypertension	0.5%
Estimated number of graduates to accrue benefits	0.6
Present value of the benefits related to hypertension	$3,829.38
Total direct benefit of delaying hypertension	**$2,297.63**

Disease/condition: Obesity (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of obesity in the population	38.5%
Incidence rate of obesity related to diet	33%
Percent of graduates practicing optimal nutritional behaviors related to obesity	7.6%
Estimated number of graduates to accrue benefits	6.2
Present value of the benefits related to obesity	$7,831.29
Total direct benefit of delaying obesity	**$48,554.00**

Disease/condition: Type 2 diabetes (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of Type 2 diabetes in the population	8.0%
Incidence rate of Type 2 diabetes related to diet	67%
Percent of graduates practicing optimal nutritional behaviors related to Type 2 diabetes	5.1%
Estimated number of graduates to accrue benefits	1.8
Present value of the benefits related to Type 2 diabetes	$64,248.55
Total direct benefit of delaying Type 2 diabetes	**$115,647.39**

Direct benefits for graduates practicing optimal nutrition behaviors, continued

Disease/condition: Osteoporosis (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of osteoporosis in the population	11.7%
Incidence rate of osteoporosis related to diet	40%
Percent of graduates practicing optimal nutritional behaviors related to osteoporosis	13.4%
Estimated number of graduates to accrue benefits	4.0
Present value of the benefits related to osteoporosis	$123,571.08
Total direct benefit of delaying osteoporosis	**$494,284.32**

Disease/condition: Foodborne Illness (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of foodborne illness in the population	2.8%
Incidence rate of foodborne illness related to diet	100%
Percent of graduates practicing optimal nutritional behaviors related to foodborne illness	42.5%
Estimated number of graduates to accrue benefits	7.7
Present value of the benefits related to foodborne illness	$28,859.50
Total direct benefit of delaying foodborne illness	**$222,218.15**

Disease/condition: Low birth weight (lbw) infants (Type C)	
Annual number of female graduates in EFNEP	608
Incidence rate of lbw infants in the population	7.2%
Incidence rate of lbw infants related to diet	90%
Percent of graduates practicing optimal nutritional behaviors related to lbw infants	3.0%
Estimated number of graduates to accrue benefits	1.2
Present value of the benefits related to lbw infants	$80,292.58
Total direct benefit of delaying low birth weight infants	**$96,351.10**

Indirect benefits for graduates practicing optimal nutrition behaviors

Disease/condition: Heart disease (Type A)	
Average age of onset for heart disease	55
Average delayed onset resulting from EFNEP	60
Average number of annual lost work days	58
Estimated number of graduates to accrue benefits	0.1
Present value of lost earnings for heart disease	$12,171.68
Total indirect benefit of delaying heart disease	**$1,217.17**

Disease/condition: Stroke (Type A)	
Average age of onset for stroke	55
Average delayed onset resulting from EFNEP	60
Average number of annual lost work days	60
Estimated number of graduates to accrue benefits	0.02
Present value of lost earnings for stroke	$8,431.37
Total indirect benefit of delaying stroke	**$168.63**

Disease/condition: Colorectal Cancer (Type A)	
Average age of onset for colorectal cancer	50
Average delayed onset resulting from EFNEP	66
Average number of annual lost work days	8.8
Estimated number of graduates to accrue benefits	0.3
Present value of lost earnings for colorectal cancer	$660.74
Total indirect benefit of delaying colorectal cancer	**$198.22**

Disease/condition: Hypertension (Type B)	
Average age of onset	50
Average delayed onset resulting from EFNEP	55
Average number of annual lost work days	41
Estimated number of graduates to accrue benefits	0.6
Present value of lost earnings for hypertension	$7,119.87
Total indirect benefit of delaying hypertension	**$4,271.92**

Indirect benefits for graduates practicing optimal nutrition behaviors, continued

Disease/condition: Obesity (Type B)	
Average age of onset of obesity	45
Average age of retirement	65
Average number of annual lost work days	1.8
Estimated number of graduates to accrue benefits	6.2
Present value of lost earnings for obesity	$479.80
Total indirect benefit of delaying obesity	**$2,974.76**

Disease/condition: Type 2 diabetes (Type B)	
Average age of onset for Type 2 diabetes	40
Average age of retirement	65
Average number of annual lost work days	8.3
Estimated number of graduates to accrue benefits	1.8
Present value of lost earnings for Type 2 diabetes	$3,114.06
Total indirect benefit of delaying Type 2 diabetes	**$5,605.31**

Disease/condition: Foodborne Illness (Type B)	
Average age of onset of foodborne illness	28
Average age of retirement	65
Average number of annual lost work days	1
Estimated number of graduates to accrue benefits	7.7
Present value of lost earnings for foodborne illness	$790.73
Total indirect benefit of delaying foodborne illness	**$6,088.62**

Table 4.6. Initial EFNEP CBA of graduates showing improvements of optimal nutrition behaviors

Direct tangible benefits	**Value**
Cardiovascular Disease	$744.61
Stroke	$725.33
Colorectal Cancer	$7,740.99
Hypertension	$9,190.51
Obesity	$26,626.39
Type 2 diabetes	$167,046.23
Osteoporosis	$679,640.94
Foodborne Illness	$126,981.80
Low birth weight infants	$152,555.90
Sub total direct tangible benefits	**$1,171,252.70**
Indirect tangible benefits	
Cardiovascular Disease	$4.868.67
Stroke	$843.14
Colorectal Cancer	$264.30
Hypertension	$17,087.69
Obesity	$1,631.32
Type 2 diabetes	$8,096.56
Foodborne Illness	$3,479.21
Sub total indirect tangible benefits	**$36,270.89**
Total benefits	**$1,207,523.59**
Direct costs	
Counties	$743,343.59
State	$82,624.72
Marginal excess burden	$140,414.61
Total costs	**$966,382.92**
Benefit cost ratio	**$1.25/$1.00**
Net present value	**$241,140.67**

Direct benefits for graduates improving optimal nutrition behaviors

Disease/condition: Heart disease (Type A)	
Annual number of graduates in EFNEP	643
Prevalence of heart disease in the population	12.9%
Incidence rate of heart disease related to diet	26.5%
Percent of graduates improving optimal nutritional behaviors related to heart disease	1.9%
Estimated number of graduates to accrue benefits	0.4
Present value of the benefits related to heart disease	$1,861.53
Total direct benefit of delaying heart disease	**$744.61**

Disease/condition: Stroke (Type A)	
Annual number of graduates in EFNEP	643
Prevalence of stroke in the population	2.7%
Incidence rate of stroke related to diet	26.5%
Percent of graduates improving optimal nutritional behaviors related to stroke	1.9%
Estimated number of graduates to accrue benefits	0.1
Present value of the benefits related to stroke	$7,253.33
Total direct benefit of delaying stroke	**$725.33**

Disease/condition: Colorectal Cancer (Type A)	
Annual number of graduates in EFNEP	643
Incidence rate of colorectal cancer in the population	5.8%
Incidence rate of colorectal cancer related to diet	35%
Percent of graduates improving optimal nutritional behaviors related to colorectal cancer	3.3%
Estimated number of graduates to accrue benefits	0.4
Present value of the benefits related to colorectal cancer	$19,352.48
Total direct benefit of delaying colorectal cancer	**7,740.99**

Direct benefits for graduates improving optimal nutrition behaviors, continued

Disease/condition: Hypertension (Type B)	
Annual number of graduates in EFNEP	643
Prevalence rate of hypertension in the population	38.7%
Incidence rate of hypertension related to diet	50%
Percent of graduates improving optimal nutritional behaviors related to hypertension	1.9%
Estimated number of graduates to accrue benefits	2.4
Present value of the benefits related to hypertension	$3,829.38
Total direct benefit of delaying hypertension	**$9,190.51**

Disease/condition: Obesity (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of obesity in the population	38.5%
Incidence rate of obesity related to diet	33%
Percent of graduates improving optimal nutritional behaviors related to obesity	4.2%
Estimated number of graduates to accrue benefits	3.4
Present value of the benefits related to obesity	$7,831.29
Total direct benefit of delaying obesity	**$26,626.39**

Disease/condition: Type 2 diabetes (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of Type 2 diabetes in the population	8.0%
Incidence rate of Type 2 diabetes related to diet	67%
Percent of graduates improving optimal nutritional behaviors related to Type 2 diabetes	7.6%
Estimated number of graduates to accrue benefits	2.6
Present value of the benefits related to Type 2 diabetes	$64,248.55
Total direct benefit of delaying Type 2 diabetes	**$167,046.23**

Direct benefits for graduates improving optimal nutrition behaviors, continued

Disease/condition: Osteoporosis (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of osteoporosis in the population	11.7%
Incidence rate of osteoporosis related to diet	40%
Percent of graduates improving optimal nutritional behaviors related to osteoporosis	18.2%
Estimated number of graduates to accrue benefits	5.5
Present value of the benefits related to osteoporosis	$123,571.08
Total direct benefit of delaying osteoporosis	**$679,640.94**

Disease/condition: Foodborne Illness (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of foodborne illness in the population	2.8%
Incidence rate of foodborne illness related to diet	100%
Percent of graduates improving optimal nutritional behaviors related to foodborne illness	24.4%
Estimated number of graduates to accrue benefits	4.4
Present value of the benefits related to foodborne illness	$28,859.50
Total direct benefit of delaying foodborne illness	**$126,981.80**

Disease/condition: Low birth weight (lbw) infants (Type C)	
Annual number of female graduates in EFNEP	608
Incidence rate of lbw infants in the population	7.2%
Incidence rate of lbw infants related to diet	90%
Percent of graduates improving optimal nutritional behaviors related to low birth weight infants	4.9%
Estimated number of graduates to accrue benefits	1.9
Present value of the benefits related to lbw infants	$80,292.58
Total direct benefit of delaying low birth weight infants	**$152,555.90**

Indirect benefits for graduates improving optimal nutrition behaviors

Disease/condition: Heart disease (Type A)	
Average age of onset for heart disease	55
Average delayed onset resulting from EFNEP	60
Average number of annual lost work days	58
Estimated number of graduates to accrue benefits	0.4
Present value of lost earnings for heart disease	$12,171.68
Total indirect benefit of delaying heart disease	**$4,868.67**

Disease/condition: Stroke (Type A)	
Average age of onset for stroke	55
Average delayed onset resulting from EFNEP	60
Average number of annual lost work days	60
Estimated number of graduates to accrue benefits	0.1
Present value of lost earnings for stroke	$8,431.37
Total indirect benefit of delaying stroke	**$843.14**

Disease/condition: Colorectal Cancer (Type A)	
Average age of onset for colorectal cancer	50
Average delayed onset resulting from EFNEP	66
Average number of annual lost work days	8.8
Estimated number of graduates to accrue benefits	0.4
Present value of lost earnings for colorectal cancer	$660.74
Total indirect benefit of delaying colorectal cancer	**$264.30**

Disease/condition: Hypertension (Type B)	
Average age of onset	50
Average delayed onset resulting from EFNEP	55
Average number of annual lost work days	41
Estimated number of graduates to accrue benefits	2.4
Present value of lost earnings for hypertension	$7,119.87
Total indirect benefit of delaying hypertension	**$17,087.69**

Indirect benefits for graduates improving optimal nutrition behaviors, continued

Disease/condition: Obesity (Type B)	
Average age of onset of obesity	45
Average age of retirement	65
Average number of annual lost work days	1.8
Estimated number of graduates to accrue benefits	3.4
Present value of lost earnings for obesity	$479.80
Total indirect benefit of delaying obesity	**$1,631.32**

Disease/condition: Type 2 diabetes (Type B)	
Average age of onset for Type 2 diabetes	40
Average age of retirement	65
Average number of annual lost work days	8.3
Estimated number of graduates to accrue benefits	2.6
Present value of lost earnings for Type 2 diabetes	$3,114.06
Total indirect benefit of delaying Type 2 diabetes	**$8,096.56**

Disease/condition: Foodborne Illness (Type B)	
Average age of onset of foodborne illness	28
Average age of retirement	65
Average number of annual lost work days	1
Estimated number of graduates to accrue benefits	4.4
Present value of lost earnings for foodborne illness	$790.73
Total indirect benefit of delaying foodborne illness	**$3,479.21**

Table 4.7. EFNEP CBA final results.

	Benefit/Cost Ratio	NPV
Initial CBA- practicing	$1.04/1.00	$39,811.24
Initial CBA- improving	$1.26/1.00	$241,140.67
10% discount rate- practicing	$0.47/$1.00	$-510,208.65
10% discount rate- improving	$0.55/$1.00	$-431,903.45
75% of graduates- practicing	$0.77/$1.00	$-218,245.02
75% of graduates- improving	$0.94/$1.00	$-55,354.08
50% of graduates- practicing	$0.52/$1.00	$-467,114.96
50% of graduates- improving	$0.62/$1.00	$-371,436.80

CHAPTER V

DISCUSSION

The purpose of this study was to estimate the economic benefit of the Oklahoma Expanded Food and Nutrition Education Program. Only one other state, Virginia, has published an evaluation of the economic benefit of EFNEP. The VCE reported a benefit-cost ratio of $10.64/$1.00 (Lambur et al., 1999), 10 times the benefit-cost ratio that this study reports. Cost benefit analyses are influenced by assumptions made by the evaluators of the programs. Key differences exist between the VCE CBA and the Oklahoma CBA that may help explain the differences between the two studies.

One important difference was the difference in the number of graduates between the two programs. Virginia had approximately five times the annual number of graduates of Oklahoma. The average age of graduates in Oklahoma was 28 years old and in Virginia the average age of graduates was 23 years old. This accounts for a large difference in benefits because the calculation of direct and indirect benefits depends on the difference between the average age of onset and the average age of EFNEP graduate. The younger the participant, the greater the cost savings.

Though the Food Practice Checklists contain the same content, the questions on the FPCs were not worded exactly the same and therefore the studies did not use the same questions for each disease/condition. Also, there were differences in the optimal nutrition behavior criteria between the two

studies. The Virginia study used less than 65 grams of fat as their criteria for heart disease, colorectal cancer, and obesity. Using 65 grams as the criteria did not account for the number of calories the graduate was consuming. Therefore, a graduate could have consumed less than or greater than 30 percent of their calories from fat. In the present study, the criteria used was less than 30 percent of the calories consumed from fat.

The Virginia optimal nutrition behavior criteria for stroke and hypertension included vegetable and fruit servings and calcium as a requirement of graduates. For the present study, calcium was not included, but the percent of calories from fat and grams of fiber were included. There is not significant evidence that calcium should be considered an optimal nutrition behavior for stroke and hypertension (Joint National Committee on Detection, Evaluation, and Treatment of High Blood Pressure, 1993). The Virginia study used less than 250 carbohydrate grams as a criteria for diabetes. The present study did not use carbohydrate grams as a criteria for diabetes. Since the nutrition management of type 2 diabetes is individualized and a specific carbohydrate intake is no longer recommended (American Dietetic Association, 1994), the researchers determined that it would not be appropriate to use a pre-determined level for carbohydrates.

In the Virginia study, three diseases had a calorie level requirement. For obesity and diabetes, less than 2300 calories was desired. This level is 100 calories higher than the RDA of 2200 calories (National Research Council, 1989). For low birth weight infants, the calorie level desired for the mother was greater

than 2100 calories. This level is 400 calories less than the RDA for pregnant women (National Research Council, 1989). The present study did not use a calorie level as a criteria for diabetes but used less than the RDA of 2200 calories for obesity. For low birth weigh infants a calorie level greater than 2500 calories was desired. It would be more accurate to estimate the energy needs for each individual, however height and weight were not recorded by EFNEP.

Another area of difference between the two studies was the percent of osteoporosis, stroke, and low birth weight infants that could be related to diet. The Virginia study used 100 percent as the incidence of these diseases/conditions related to diet because of a lack of information. However, using 100 percent overestimated the value of these benefits and presented a much higher benefit-cost ratio. The present study took into account other factors that contribute to the development of osteoporosis, stroke and low birth weight infants such as genetics, smoking, and environmental factors.

The Virginia study calculated hypertension as a Type A disease. For this study, hypertension was classified as a Type B disease because it can be controlled through diet and medication and because it is a major risk factor for heart disease and stroke (AHA, 1998). The Virginia study also included commonly occurring infant diseases such as otitis media, gastroenteritis, and viral infections, among the disease/conditions. The present study did not include commonly occurring infant diseases because there is not enough evidence that diet is strongly related to these conditions. Other differences between the studies in the prevalence of disease/condition in the low-income population and

wage rates were due to more current literature that was used by the present study.

Benefit-cost Ratio

The present study showed a benefit-cost ratio greater than $1.00 for both graduates practicing optimal nutrition behaviors and graduates showing improvements in optimal nutrition behaviors. Therefore, the program is considered acceptable (Clemmer et al., 1996).

Net Present Value

The present study showed a positive net present value for both graduates practicing optimal nutrition behaviors and graduates showing improvements in optimal nutrition behaviors. Because the study presented a net present value greater than zero, the program is considered efficient (Clemmer et al., 1996).

Assumptions

Several assumptions were made for the present study. One assumption was that graduates currently practicing optimal nutrition behaviors would continue the behaviors for the rest of their lives and that optimal nutrition behaviors truly decreased the incidence of the disease/condition. It was also assumed that the data collected was accurate and reflected the participants' actual behaviors. The final assumption of this study was that EFNEP participants were representative of the low-income population.

Limitations

The present study had several limitations. The subjects were not randomly selected. EFNEP participants did not all receive the same education lessons and the specific education topics discussed with each graduate were not known. The Food Practice Checklist and 24-hour dietary recall were not always administered on a one-to-one basis. Therefore, the dietary information may not be complete. The ERS4 database of foods is a limited database so substitutions may have been made if the food consumed was not in the database. It was not known if any of the graduates already had any existing disease/condition. Also, no anthropometric data such as height and weight was available.

Conclusions

The initial cost benefit analysis of the Oklahoma Expanded Food and Nutrition Education Program showed that the benefit of the program exceeds the cost. Therefore, it can be inferred that EFNEP provides a benefit to society and is considered acceptable by economic standards (Clemmer et al., 1996). The study also showed that most EFNEP graduates demonstrated improvements in food choices that will help prevent the development of chronic diseases.

Implications

The present study demonstrates to policy makers that the Expanded Food and Nutrition Education Program is deserving of federal funds. Policy makers

should be aware that ENFEP is economically advantageous and also nutritionally beneficial.

It would be beneficial for EFNEP to begin collecting anthropometric data such as self-reported heights and weights and medical histories of participants. With this data, a more accurate cost benefit analysis could be conducted because the optimal nutrition behavior criteria could be individualized based on their current height, weight, and medical status. Education topics could also be individualized based on the participant.

There are other nutrients related to the diseases/conditions that would be important to analyze. Currently, sodium, cholesterol, folate, and saturated fat levels are not analyzed in ERS4. Sodium, important for the dietary management of heart disease, stroke, and hypertension, is only measured through the Food Practice Checklist question number eight. This study demonstrates that a high number of participants prepared foods with salt. However, it was not known the actual sodium levels in the diet. Analyzing these nutrients would give a more accurate estimate of the participants' dietary intake.

Keeping track of each participant's education topics would also be beneficial in analyzing the effectiveness of EFNEP. If specific education topics were available to program evaluators, areas of improvement could be identified. After determining how many graduates are practicing optimal nutrition behaviors for the disease/conditions, evaluators could then see what education topics are being taught and what topics need further education. Adding disease specific education topics may also improve the outcome of the cost benefit analysis. For

example, if a participant has known risk factors for heart disease, the NEA could require the participant to have an education lesson on dietary habits that will help reduce the participants' risk for heart disease.

Future Research

More states must conduct a cost benefit analysis of their EFNEP program to ensure the validity of using cost benefit analysis as an economic evaluation of EFNEP. Cost benefit studies should also be done on more nutrition education programs such as the Food Stamp Program. Studies of these programs would also further validate using cost benefit analysis as an economic evaluation of nutrition education programs.

A study should also be done to compare one-on-one instruction and group education. This study could evaluate the cost-effectiveness of each method to determine which method is more cost effective. Also, the study could evaluate which method best improves dietary behavior. This type of study would help the program determine what method of instruction should be emphasized to improve the benefit of the study both economically and nutritionally.

Traditionally, 24-hour recalls are taken on the homemaker of the family and they are the recipients of the education. An important area to study would be the 'ripple effect'; what effect does the homemakers education have on the whole family? This study could demonstrate that EFNEP not only affects the direct recipients of the education, but also affects how the whole family makes choices regarding their dietary practices and behaviors.

Further research should also be conducted on the incidence of disease related to diet for the various diseases/conditions. Studies should also be conducted on the benefit of improving dietary behaviors decrease the risk of disease and the levels of improvement needed to decrease risk. Another important area of future research pertains to lost wages due to osteoporosis. Studies need to be conducted to investigate the number of work days lost before the age of 65 due to osteoporosis.

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APPENDIX A

Adjusted treatment costs

Disease/ condition	Base year index (1999)	Year cost reported-associated index[1]	Unadjusted cost	Adjusted cost
Heart disease	1.0434	1999 – 1.0434	$3,960	$3,960
Stroke	1.0434	1996 – 1.0000	$17,666	$18,433
HTN	1.0434	1999 – 1.0434	$694	$694
Colorectal cancer	1.0434	1999 – 1.0434	$57,527	$57,527
Obesity	1.0434	1998 – 1.0300	$1,031	$1,044
Type 2 diabetes	1.0434	1997 – 1.0170	$6,242	$6,404
Osteoporosis	1.0434	1995 – 0.9811	$11,582	$12.317
Foodborne illness	1.0434	1996 – 1.0000	$1,431	$1,492
Low birth weight infants	1.0434	1987 – 0.7758	$59,700	$80,293

[1] Budget of the United States Government. Table 10.1 Gross Domestic Product and Deflators used in the historical tables: 1940-2005. Available at: http://www.access.gpo.gov/usbudget/fy2001.hist.html. 2000.

COMMUNITY NUTRITION EDUCATION PROGRAM
ADULT ENROLLMENT FORM
FAMILY RECORD

[ ] EFNEP [ ] ONE — **ENTRY** (Reverse for EXIT)

NEA ID# **NEA NAME:**

Family ID: | Unit #: | Computer Date: | Print Report? Y N

Fill out for each family at ENTRY (reverse for EXIT). Keep in family file after Agent review & computer entry.

Write In, check &/or circle either Y, N, F, M or appropriate #. (Y = Yes; N = No; F = Female; M = Male)

1. Have you previously been enrolled in: EFNEP? **Y N** ONE? **Y N**
   If yes: did you receive a Certificate of Completion? **Y N**
   Where?

2. Name First: Last:

3. Street _____

4. City _____

5. State **OK** 6. Zip

7. Phone ( )

8. Age | 9. Sex **F M**

10. Pregnant? **Y N**

11. Nursing? **Y N**

12. **Race Code**: Check One

1-00	_____	White (non-Hispanic)
2-00	_____	Black (non-Hispanic)
3-00	_____	Am Indian/Alaskan Native
4-00	_____	Hispanic
5-00	_____	Asian or Pacific Islander

13. **Residence**: Check One

_____	1	Farm
_____	2	Town under 10,000 & rural non-farm
_____	3	Town/City 10,000 to 50,000
_____	4	Suburb of City over 50,000
_____	5	Central City over 50,000

14. **Total Household Income Last Month**: **$**

15. **Instruction (Lesson) Type**: Check One

1	_____	Group
2	_____	Individual
3	_____	Both
4	_____	Other

16. **Total Number of Lessons:**

17. **Household Members: Children by Age**

List First Name of Children (through Age 19)	Age (Years)
1)	
2)	
3)	
4)	
5)	
6)	
7)	
8)	
9)	
10)	

18. **Number of Other Adults in Household**: (don't count homemaker)

19. **Entry Date:**

20. **SubGroup**: **A** = EFNEP **B** = ONE Program

21. **Public Assistant Family Participates in at ENTRY**
Circle Y or N to *all* that apply.

WIC/CSFP	Y	N
Food Stamps	Y	N
FDPIR	Y	N
TEFAP (Commodities)	Y	N
Head Start	Y	N
Child Nutrition	Y	N
TANF	Y	N
Food Stamp Eligible (ONE program only)	Y	N

Other (Specify) _____

COMMUNITY NUTRITION EDUCATION PROGRAM
ADULT ENROLLMENT FORM
FAMILY RECORD

☐ EFNEP
☐ ONE

EXIT
(Reverse for Entry)

COMPLETE EXIT INFORMATION ONLY WHEN LEAVING CNEP PROGRAM

Fill out for each family at EXIT (reverse for ENTRY). Keep in family file after Agent review & computer entry.

NEA ID# **NEA NAME:**

1. Family ID: NAME:

Write in, check &/or circle either Y, N or appropriate #. (Y = Yes; N = No)

16. Total Number of Lessons:

22. Exit Reason: (Check)

_____ 1 Educational Objective Met
_____ 2 Returned to School
_____ 3 Took Job
_____ 4 Family Concerns
_____ 5 Staff Vacancy
_____ 6 Moved
_____ 7 Lost Interest
_____ 8 Other (Specify) _____
_____
_____
_____
_____ 9 Other Obligations
_____ A Lost Contact with Client

23. Exit Date:

24. Did family receive assistance as the result of a referral or suggestion from CNEP personnel? **Y N**

If yes, check *all* that apply.

_____ WIC/CSFP
_____ Food Stamps
_____ FDPIR
_____ TEFAP (Commodities)
_____ Head Start
_____ Child Nutrition
_____ TANF
_____ Other (Specify) _____
_____
_____
_____

NEA Comments/Concerns:

FDPIR	Food Distribution Program on Indian Reservation
TANF	Temporary Aid to Needy Families
TEFAP	Temporary Emergency Food Assostance Program
WIC/CSFP	Women, Infants, & Children/Community Supplemental Food Program

CNEP SURVEY CHECKLIST

Participant's Name:	ID #:
Date	Check if Interview (NEA completed form) Entry Intermediate Exit

This is a survey about ways to plan and fix foods for your family. As you read each question, think about the recent past. This is not a test. There are not any wrong answers. If you do not have children, just answer the questions for yourself.

For these questions, think about how you usually do things. Please put a check in the box that best answers each question.	1 Do Not Do	2 Seldom	3 Some-times	4 Most of the time	5 Almost Always
(1) How often do you plan meals ahead of time?					
(2) How often do you compare prices before you buy food?					
(3) How often do you run out of food before the end of the month?					
(4) How often do you shop with a grocery list?					
(5) This question is about meat and dairy foods. How often do you let these foods sit out for more than two hours?					
(6) How often do you thaw frozen foods at room temperature?					
(7) When deciding what to feed your family, how often do you think about healthy food choices?					
(8) How often have you prepared foods without adding salt?					
(9) How often do you use the "Nutrition Facts" on the food label to make food choices?					
(10) How often do your children eat something in the morning within 2 hours of waking up?					

HOMEMAKER'S 24-HOUR FOOD RECALL (Form A)

ID #:		2. Date Taken:
3. HM Name:		4. NEA Name:
5. Pregnant 0 Yes 0 No	6. Nursing 0 Yes 0 No	7. Takes Nutritional Supplements 0 Yes 0 No If "Yes" List Type:
8. Money Spent on Food Last Month: $		

MEAL TYPE MEAL TYPE Morning = 1 Afternoon = 4 MidMorning = 2 Evening = 5 Noon = 3 Late Evenin = 6	SERVING ABBREVIATIONS *TBSP = tablespoon* c = cup tsp = teaspoon lb = pound oz =ounce sl = slice	9. Check Which Food Record: 0 ENTRY 0 EXIT [I Other: Number

10. What did homemaker eat and drink in the last 24 hours? (To be filled out b NEA or Homemaker)			11. To Be Coded *By* NEA:	
FOOD ITEMS AND DESCRIPTION (List all foods and beverages. List separately main ingredients in mixed dishes.)	AMOUNT EATEN (ex: 1/2 c	MEAL TYPE	FOOD ID NUMBER	AMOUNT CODE ex: .50)

APPENDIX C

Instructions for determining number of EFNEP graduates.

1. Open **SPSS.**

2. Merge individual unit files.

   a. Go to **File**, Select **Open**.

   b. Select **unit folder**, click **open**.

   c. Select **Adult.dbf** file and **Open**.

   d. Select **Data**, choose **Sort Cases**.

   e. Click on **adultid** for the left box and then click the **arrow** to move adultid to the empty box. Choose **sort order ascending**. Click **OK**.

   f. Go to **File**, select **Save As**. Rename file **Adult**.

   g. Repeat steps **a-f** for **checklist.dbf** and **recall.dbf**.

   h. Open **Adult** file.

   i. Select **Data**, highlight **Merge Files**. Click **Add Variables**.

   j. Select **checklist** file. Click **Open**.

   k. A box will appear that states "Add variables from C:/..". In the excluded variables box, click on **adultid [+].** Select **Match cases on key variables in sorted files**. Click the **lower arrow box** to move adultid [+] to the key variables box. Click **OK**.

   l. A warning message will appear. Click **OK**.

   m. Repeat steps **i-l** to merge recall file with adult and checklist merged file.

   n. Go to **File**, select **Save As**. Save file as **unit name**.

o. Repeat steps **a-n** for every EFNEP unit.

3. Merge all individual unit files into one large file.

   a. Open **1st unit file**.

   b. Select **Data**, highlight **Merge files**, click **Add Cases**.

   c. Select **2nd unit file**. Click **Open**.

   d. A box will appear that states "Add cases from C:/..". Click **OK**.

   e. Repeat until all units have been merged.

   f. Save file as **GRADUATES**.

4. Create **ENTRY** and **EXIT** files.

   a. Open **GRADUATES** file.

   b. Select **Data**, choose **Select Cases**.

   c. Select **If condition is satisfied.**

   d. Click **If...**

      To enter the If... statement, select the variable you want on the left and click the arrow key to move the variable to the box. Use the buttons below the box for >=, <=, =. +, &, and the numbers you need to enter. Each individual variable expression must be separated by the &.

   e. Enter **isexit = "T"**. (Be sure to include the " " around the T).

   f. Click **continue**.

   g. Select **unselected cases are DELETED**. Click **OK**.

h. In the excluded variables box, click on **adultid [+] and unitid [+].** Select **Match cases on key variables in sorted files.** Click the **lower arrow box** to move adultid [+] and unitid [+] to the key variables box. Click **OK**.

i. Save As **EXIT**.

j. Open **GRADUATES** file.

k. Select **Data**, choose **Select Cases**.

l. Select **If condition is satisfied**.

m. Click **If...** Enter **isexit = "F"**. Click **Continue**.

n. Select **unselected cases are DELETED**. Click **OK**.

o. Select **Data**, **Sort Cases**.

p. In the excluded variables box, click on **adultid [+] and unitid [+].** Select **Match cases on key variables in sorted files**. Click the **lower arrow box** to move adultid [+] and unitid [+] to the key variables box. Click **OK**.

p. Save As **ENTRY.**

5. Change variable names in ENTRY and EXIT files. Variable names must be changed so that the ENTRY and EXIT files can be merged into one large file.

   a. Open **ENTRY** file.

   b. **Highlight column** of variable you need to change.

   c. Select **Data**, choose **Define variable**.

   d. **Rename** variable in the box.

      Example: q07 change to b_q07 for entry and e_q07 for exit

   e. Click **OK**.

f. Repeat for all variables that are included in the criteria for practicing ONB. For instance, the variables that were changed in this study were: checklist questions 5-9, dairy servings, bread servings, vegetable servings, fruit servings, grams of fat, grams of fiber, number of calories, and mg of calcium.

g. Delete variables from checklist and recall that are not being used for the study. Highlight the column. Press delete on keyboard.

h. Save file after you have completed changing all the variable names.

i. Repeat steps **a-h** for EXIT file.

6. Create 2 new variables in ENTRY and EXIT files: % fat and total fruit and vegetable servings.

   a. Open **ENTRY** file.

   b. Select **Transform**, click **Compute**.

   c. In the target variable, type **b_pctfat**.

   d. Enter **(b_fat * 9)/ b_kcal** in the numeric expression box using the variables located in the box on the left and the key pad below the numeric expression box.

   e. Click **OK.** The new variable column will be added at the end of the variables.

   f. Select **Transform**, click **Compute**.

   g. In the target variable, type **b_fv**.

   h. Enter **b_veg + b_fruit** in the numeric expression box.

i. Click **OK**.

j. Save ENTRY file.

k. Repeat for EXIT file, using **e_pctfat** and **e_fv** as new variable names.

7. Merge ENTRY and EXIT files.

   a. Open **ENTRY** file.

   b. Select **Data**, highlight **Merge files**, click on **Add variables**.

   c. Select **EXIT** file, Click **Open**.

   d. Select **adultid [+] and unitid [+]** as excluded variables. Select **Match key cases on key variables in sorted files**. Click **lower arrow key** to move adultid [+] and unitid [+] to key variables box. Click **OK**.

   e. A warning message will appear. Click **OK**.

   f. Save file as **GRADUATES**.

The file now contains the entry and exit information in one record for each graduate of EFNEP. Now the graduates who are practicing optimal nutrition behaviors for each disease/condition at exit but not at entry must be extracted from the data set.

Instructions for selecting graduates practicing optimal nutrition behaviors (ONB)

1. Open **SPSS**.

2. Open **GRADUATES** file.
3. Select **Data**, choose **Select Cases**.
4. Select **If condition is satisfied**.
5. Click **If**.... Enter the Exit disease condition statement.

   Example: Heart disease

   e_q07 >= 4 & e_q08 >= 4 & e_q09 >= 4 & e_pctfat <= .3 &

   e_fv >= 5 & e_fiber >= 20

6. Click **continue**.
7. Select **unselected cases are DELETED**. Click **OK**. This will leave only graduates practicing ONB at exit in the data set.
8. Select **Data**, choose **Select Cases**.
9. Click **Reset** from choices at bottom of box.
10. Select **If condition is satisfied**.
11. Click **If**... Enter the Entry disease condition statement.

    Example: Heart disease

    b_q07 >= 4 & b_q08 >= 4 & b_q09 >= 4 & b_pctfat <= .3 &

    b_fv >= 5 & b_fiber >= 20

12. Click **continue**.
13. Select **unselected cases are FILTERED**. Click **OK**.

14. Select **Data**, choose **Select Cases**.

15. Click **Reset**.

16. Select **If condition is satisfied**.

17. Click **If....** Enter **filter = 0**.

18. Click **continue**.

19. Select **unselected cases are DELETED**. Click **OK**.

20. **Save** file as disease

21. Repeat for each disease/condition.

APPENDIX D

CARDIOVASCULAR DISEASE
Average age of onset: 55
Number of years of survival after treatment: 10
Adjusted cost: $3,960
Number of missed days from work: 58
Wages lost because of missed days from work for 10 years: $25,891.20

DIRECT BENEFITS	
Age of Participant	
28-54	$0
55	$1,060.68
56	$1,010.17
57	$962.07
58	$916.25
59	$872.62
60	$831.07
61	$791.50
62	$753.81
63	$717.91
64	$683.72
TOTAL	$8,599.68
29-59	$0
60	$831.07
61	$791.50
62	$753.81
63	$717.91
64	$683.72
65	$651.16
66	$620.15
67	$590.62
68	$562.50
69	$535.71
TOTAL	$6,738.15
DIRECT	$8,599.68
PRESENT	- $6,738.15
VALUE	**$1,861.53**

INDIRECT BENEFITS →	
Age of Participant	
28-54	$0
55	$6,934.91
56	$6,604.68
57	$6,290.17
58	$5,990.64
59	$5,705.37
60	$5,433.69
61	$5,174.94
62	$4,928.51
63	$4,693.82
64	$4,470.31
TOTAL	$56,227.04
29-59	$0
60	$5,433.69
61	$5,174.94
62	$4,928.51
63	$4,693.82
64	$4,470.31
65	$4,257.44
66	$4,054.70
67	$3,861.62
68	$3,677.73
69	$3,502.60
TOTAL	$44,055.36
INDIRECT	$56,227.04
PRESENT	- $44,055.36
VALUE	**$12,171.68**

STROKE
Average age of onset: 55
Number of years of survival after treatment: 8
Adjusted cost: $18,433.40
Number of missed days from work: 60
Wages lost because of missed days from work for 8 years: $21,427.20

DIRECT BENEFITS	
28-54	$0
55	$4,937.36
56	$4,702.24
57	$4,478.33
58	$4,265.07
59	$4,061.97
60	$3,868.55
61	$3,684.33
62	$3,508.89
TOTAL	$33,506.74
29-59	$0
60	$3,838.55
61	$3,684.33
62	$3,508.89
63	$3,341.80
64	$3,182.66
65	$3,031.11
66	$2,886.77
67	$2,749.30
TOTAL	$26,253.41
DIRECT	$33,506.74
PRESENT	-$26,253.41
VALUE	**$7,253.33**

INDIRECT BENEFITS	
28-54	$0
55	$5,739.24
56	$5,465.94
57	$5,205.66
58	$4,957.77
59	$4,721.69
60	$4,496.84
61	
62	
TOTAL	$38,948.62
29-59	$0
60	$4,496.84
61	$4,282.71
62	$4,078.77
63	$3,884.54
64	$3,699.56
65	$3,523.40
66	$3,355.61
67	$3,195.82
TOTAL	$30,517.25
INDIRECT	$38,948.62
PRESENT	-$30,517.25
VALUE	**$8,431.37**

COLORECTAL CANCER
Average age of onset: 50
Number of years of survival after treatment: 5
Adjusted cost: $57,526.88
Number of days missed from work: 8.8
Wages lost due to days missed from work: $1,964.16

DIRECT BENEFITS	
28-49	$0
50	$19,665.56
51	$18,729.10
52	$17,837.24
53	$16,987.85
54	$16,178.90
TOTAL	$89,398.65
28-54	$0
55	$15,408.48
56	$14,674.74
57	$13,975.94
58	$13,310.42
59	$12,676.59
TOTAL	$70,046.17
DIRECT	$89,398.65
PRESENT	-$70,046.17
VALUE	**$19,352.48**

INDIRECT BENEFITS	
28-49	$0
50	$671.45
51	$639.47
52	$609.02
53	$580.02
54	$552.40
TOTAL	$3,052.36
28-54	$0
55	$526.10
56	$501.05
57	$477.19
58	$454.46
59	$432.82
TOTAL	$2,391.62
INDIRECT	$3,052.36
PRESENT	- $2,391.62
VALUE	**$660.74**

HYPERTENSION
Average age of onset: 50
Adjusted cost: $694
Number of missed days from work: 41
Wages lost because of missed days from work: $1,830.24

DIRECT BENEFITS	
28-49	$0
50	$237.24
51	$225.95
52	$215.19
53	$204.94
54	$195.18
55	$185.89
56	$177.03
57	$168.60
58	$160.58
59	$152.93
60	$145.65
61	$138.71
62	$132.11
63	$125.82
64	$119.82
65	$114.12
66	$108.68
67	$103.51
68	$98.58
69	$93.89
70	$89.41
71	$85.16
72	$81.10
73	$77.24
74	$73.56
75	$70.06
76	$66.72
77	$63.55
78	$60.52
79	$57.64
DIRECT PV	**$3,829.38**

INDIRECT BENEFITS	
28-49	$0
50	$625.67
51	$595.87
52	$567.50
53	$540.47
54	$514.74
55	$490.23
56	$466.88
57	$444.65
58	$423.48
59	$403.31
60	$384.11
61	$365.81
62	$348.39
63	$331.80
64	$316.00
65	$300.96
INDIRECT PV	**$7,119.87**

OBESITY
Average age of onset: 45
Adjusted cost: $1,044
Number of missed days from work: 1.8
Wages lost because of missed days from work: $81.69

DIRECT BENEFITS	
28-44	$0
45	$455.49
46	$433.80
47	$413.15
48	$393.47
49	$374.74
50	$356.89
51	$339.90
52	$323.71
53	$308.30
54	$293.62
55	$279.63
56	$266.32
57	$253.64
58	$241.56
59	$230.06
60	$219.10
61	$208.67
62	$198.73
63	$189.27
64	$180.25
65	$171.67
66	$163.50
67	$155.71
68	$148.30
69	$141.23
70	$134.51
71	$128.10
72	$122.00
73	$116.19
74	$110.66
75	$105.39
76	$100.37
77	$95.60
78	$91.05
79	$86.71
DIRECT PV	**$7,831.29**

INDIRECT BENEFITS	
28-44	$0
45	$35.64
46	$33.94
47	$32.33
48	$30.79
49	$29.32
50	$27.93
51	$26.60
52	$25.33
53	$24.12
54	$22.97
55	$21.88
56	$20.84
57	$19.85
58	$18.90
59	$18.00
60	$17.14
61	$16.33
62	$15.55
63	$14.81
64	$14.10
65	$13.43
INDIRECT PV	**$479.80**

TYPE 2 DIABETES
Average age of onset: 40
Adjusted cost: $6,404
Number of missed days from work: 8.3
Wages lost because of missed days from work: $370.51

DIRECT BENEFITS	
28-39	$0
40	$3,565.99
41	$3,396.18
42	$3,234.46
43	$3,080.44
44	$2,933.75
45	$2,794.05
46	$2,661.00
47	$2,534.28
48	$2,413.60
49	$2,298.67
50	$2,189.21
51	$2,084.96
52	$1,985.67
53	$1,891.12
54	$1,801.07
55	$1,715.30
56	$1,633.62
57	$1,555.83
58	$1,481.74
59	$1,411.18
60	$1,343.98
61	$1,279.98
62	$1,219.03
63	$1,160.98
64	$1,105.70
65	$1,053.05
66	$1,002.90
67	$955.14
68	$909.66
69	$866.34
70	$825.09
71	$785.80
72	$748.40
73	$712.74
74	$678.80
75	$646.48
76	$615.69
77	$586.37
78	$558.45
79	$531.85
DIRECT PV	**$64,248.55**

INDIRECT BENEFITS	
28-39	$0
40	$206.31
42	$196.49
42	$187.13
43	$178.22
44	$169.73
45	$161.65
46	$153.95
47	$146.62
48	$139.64
49	$132.99
50	$126.66
51	$120.63
52	$114.88
53	$109.41
54	$104.20
55	$99.24
56	$94.51
57	$90.01
58	$85.73
59	$81.65
60	$77.76
61	$74.05
62	$70.53
63	$67.17
64	$63.97
65	$60.93
INDIRECT PV	**$3,114.06**

OSTEOPOROSIS
Average age of onset: 40
Adjusted cost: $12,317

DIRECT BENEFITS	
28-39	$0
40	$6,858.57
41	$6,531.97
42	$6,220.92
43	$5,924.69
44	$5,642.56
45	$5,373.87
46	$5,117.97
47	$4,874.26
48	$4,642.15
49	$4,421.09
50	$4,210.56
51	$4,010.06
52	$3,819.11
53	$3,637.24
54	$3,464.04
55	$3,299.09
56	$3,141.99
57	$2,992.37
58	$2,849.88
59	$2,714.17
60	$2,584.92
61	$2,461.83
62	$2,344.60
63	$2,232.95
64	$2,126.62
65	$2,025.35
66	$1,928.91
67	$1,837.06
68	$1,749.58
69	$1,666.26
70	$1,586.92
71	$1,511.35
72	$1,439.38
73	$1,370.84
74	$1,305.56
75	$1,243.39
76	$1,184.18
77	$1,127.79
78	$1,074.09
79	$1,022.94
DIRECT PV	**$123,571.08**

FOODBORNE ILLNESS

DIRECT	BENEFITS
28	$1,492.29
29	$1,421.29
30	$1,353.55
31	$1,289.10
32	$1,227.71
33	$1,169.25
34	$1,113.57
35	$1,060.55
36	$1,010.04
37	$961.95
38	$916.14
39	$872.51
40	$830.97
41	$791.40
42	$753.71
43	$717.82
44	$683.64
45	$651.08
46	$620.08
47	$590.55
48	$562.43
49	$535.65
50	$510.14
51	$485.85
52	$462.71
53	$440.68
54	$419.69
55	$399.71
56	$380.67
57	$362.55
58	$345.28
59	$328.84
60	$313.18
61	$298.27
62	$284.07
63	$270.54
64	$257.66
65	$245.39
66	$233.70
67	$222.57
68	$211.97
69	$201.88
70	$192.27
71	$183.11
72	$174.39
73	$166.09
74	$158.18
75	$150.65
76	$143.47
77	$136.64
78	$130.13
79	$123.94
DIRECT PV	**$28,859.50**

INDIRECT	BENEFITS
28	$44.64
29	$42.51
30	$40.49
31	$38.56
32	$36.73
33	$34.98
34	$33.31
35	$31.72
36	$30.21
37	$28.78
38	$27.41
39	$26.10
40	$24.86
41	$23.68
42	$22.55
43	$21.48
44	$20.45
45	$19.48
46	$18.55
47	$17.67
48	$16.83
49	$16.03
50	$15.26
51	$14.55
52	$13.84
53	$13.18
54	$12.56
55	$11.96
56	$11.39
57	$10.85
58	$10.33
59	$9.84
60	$9.37
61	$8.93
62	$8.50
63	$8.10
64	$7.71
65	$7.34
INDIRECT PV	**$790.73**

APPENDIX E

EFNEP CBA- 75% of graduates practicing optimal nutrition behaviors

Direct tangible benefits	**Value**
Cardiovascular Disease	$130.30
Stroke	$72.53
Colorectal Cancer	$3,870.50
Hypertension	$1,531.75
Obesity	$36,807.06
Type 2 diabetes	$83,523.12
Osteoporosis	$370,713.24
Foodborne Illness	$164,499.15
Low birth weight infants	$72,263.32
Sub total direct tangible benefits	**$733,410.97**
Indirect tangible benefits	
Cardiovascular Disease	$852.02
Stroke	$84.31
Colorectal Cancer	$132.15
Hypertension	$2,847.95
Obesity	$2,255.06
Type 2 diabetes	$4,048.28
Foodborne Illness	$4,507.16
Sub total indirect tangible benefits	**$14,726.93**
Total benefits	**$748,137.90**
Direct costs	
Counties	$743,343.59
State	$82,624.72
Marginal excess burden	$140,414.61
Total costs	**$966,382.92**
Benefit cost ratio	**$0.77/$1.00**
Net present value	**$-218,245.02**

Direct tangible benefits- 75% of graduates practicing optimal nutrition behaviors

Disease/condition: Heart disease (Type A)	
Annual number of graduates in EFNEP	643
Prevalence of heart disease in the population	12.9%
Incidence rate of heart disease related to diet	26.5%
Percent of graduates practicing optimal nutritional behaviors related to heart disease	0.3%
Estimated number of graduates to accrue benefits	0.07
Present value of the benefits related to heart disease	$1,861.53
Total direct benefit of delaying heart disease	**$130.30**

Disease/condition: Stroke (Type A)	
Annual number of graduates in EFNEP	643
Prevalence of stroke in the population	2.7%
Incidence rate of stroke related to diet	26.5%
Percent of graduates practicing optimal nutritional behaviors related to stroke	0.3%
Estimated number of graduates to accrue benefits	0.01
Present value of the benefits related to stroke	$7,253.33
Total direct benefit of delaying stroke	**$72.53**

Disease/condition: Colorectal Cancer (Type A)	
Annual number of graduates in EFNEP	643
Incidence rate of colorectal cancer in the population	5.8%
Incidence rate of colorectal cancer related to diet	35%
Percent of graduates practicing optimal nutritional behaviors related to colorectal cancer	1.5%
Estimated number of graduates to accrue benefits	0.2
Present value of the benefits related to colorectal cancer	$19,352.48
Total direct benefit of delaying colorectal cancer	**$3,870.50**

Direct benefits- 75% of graduates practicing optimal nutrition behaviors, continued

Disease/condition: Hypertension (Type B)	
Annual number of graduates in EFNEP	643
Prevalence rate of hypertension in the population	38.7%
Incidence rate of hypertension related to diet	50%
Percent of graduates practicing optimal nutritional behaviors related to hypertension	0.3%
Estimated number of graduates to accrue benefits	0.4
Present value of the benefits related to hypertension	$3,829.38
Total direct benefit of delaying hypertension	**$1,531.75**

Disease/condition: Obesity (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of obesity in the population	38.5%
Incidence rate of obesity related to diet	33%
Percent of graduates practicing optimal nutritional behaviors related to obesity	5.7%
Estimated number of graduates to accrue benefits	4.7
Present value of the benefits related to obesity	$7,831.29
Total direct benefit of delaying obesity	**$36,807.06**

Disease/condition: Type 2 diabetes (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of Type 2 diabetes in the population	8.0%
Incidence rate of Type 2 diabetes related to diet	67%
Percent of graduates practicing optimal nutritional behaviors related to Type 2 diabetes	3.8%
Estimated number of graduates to accrue benefits	1.3
Present value of the benefits related to Type 2 diabetes	$64,248.55
Total direct benefit of delaying Type 2 diabetes	**$83,523.12**

Direct benefits- 75% of graduates practicing optimal nutrition behaviors, continued

Disease/condition: Osteoporosis (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of osteoporosis in the population	11.7%
Incidence rate of osteoporosis related to diet	40%
Percent of graduates practicing optimal nutritional behaviors related to osteoporosis	10.1%
Estimated number of graduates to accrue benefits	3.0
Present value of the benefits related to osteoporosis	$123,571.08
Total direct benefit of delaying osteoporosis	**$370,713.24**

Disease/condition: Foodborne Illness (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of foodborne illness in the population	2.8%
Incidence rate of foodborne illness related to diet	100%
Percent of graduates practicing optimal nutritional behaviors related to foodborne illness	31.9%
Estimated number of graduates to accrue benefits	5.7
Present value of the benefits related to foodborne illness	$28,859.50
Total direct benefit of delaying foodborne illness	**$164,499.15**

Disease/condition: Low birth weight (lvw) infants (Type C)	
Annual number of female graduates in EFNEP	608
Incidence rate of lbw in the population	7.2%
Incidence rate of lbw infants related to diet	90%
Percent of graduates practicing optimal nutritional behaviors related to low birth weight infants	2.3%
Estimated number of graduates to accrue benefits	0.9
Present value of the benefits related to lbw infants	$80,292.58
Total direct benefit of delaying low birth weight infants	**$72,263.32**

Indirect benefits- 75% of graduates practicing optimal nutrition behaviors

Disease/condition: Heart disease (Type A)	
Average age of onset for heart disease	55
Average delayed onset resulting from EFNEP	60
Average number of annual lost work days	58
Estimated number of graduates to accrue benefits	0.07
Present value of lost earnings for heart disease	$12,171.68
Total indirect benefit of delaying heart disease	**$852.02**

Disease/condition: Stroke (Type A)	
Average age of onset for stroke	55
Average delayed onset resulting from EFNEP	60
Average number of annual lost work days	60
Estimated number of graduates to accrue benefits	0.01
Present value of lost earnings for stroke	$8,431.37
Total indirect benefit of delaying stroke	**$84.31**

Disease/condition: Colorectal Cancer (Type A)	
Average age of onset for colorectal cancer	50
Average delayed onset resulting from EFNEP	66
Average number of annual lost work days	8.8
Estimated number of graduates to accrue benefits	0.2
Present value of lost earnings for colorectal cancer	$660.74
Total indirect benefit of delaying colorectal cancer	**$132.15**

Disease/condition: Hypertension (Type B)	
A) Average age of onset	50
B) Average delayed onset resulting from EFNEP	55
C) Average number of annual lost work days	41
D) Estimated number of graduates to accrue benefits	0.4
E) Present value of lost earnings for hypertension	$7,119.87
Total indirect benefit of delaying hypertension	**$2,847.95**

Indirect benefits- 75% of graduates practicing optimal nutrition behaviors, continued

Disease/condition: Obesity (Type B)	
Average age of onset of obesity	45
Average age of retirement	65
Average number of annual lost work days	1.8
Estimated number of graduates to accrue benefits	4.7
Present value of lost earnings for obesity	$479.80
Total indirect benefit of delaying obesity	**$2,255.06**

Disease/condition: Type 2 diabetes (Type B)	
Average age of onset for Type 2 diabetes	40
Average age of retirement	65
Average number of annual lost work days	8.3
Estimated number of graduates to accrue benefits	1.3
Present value of lost earnings for Type 2 diabetes	$3,114.06
Total indirect benefit of delaying Type 2 diabetes	**$4,048.28**

Disease/condition: Foodborne Illness (Type B)	
Average age of onset of foodborne illness	28
Average age of retirement	65
Average number of annual lost work days	1
Estimated number of graduates to accrue benefits	5.7
Present value of lost earnings for foodborne illness	$790.73
Total indirect benefit of delaying foodborne illness	**$4,507.16**

EFNEP CBA- 50% of graduates practicing optimal nutrition behaviors

Direct tangible benefits	**Value**
Cardiovascular Disease	$74.46
Stroke	$65.28
Colorectal Cancer	$1,935.25
Hypertension	$765.88
Obesity	$24,276.99
Type 2 diabetes	$57,823.70
Osteoporosis	$247,142.16
Foodborne Illness	$109,661.10
Low birth weight infants	$48,175.55
Sub total direct tangible benefits	**$489,920.37**
Indirect tangible benefits	
Cardiovascular Disease	$486.87
Stroke	$75.88
Colorectal Cancer	$66.07
Hypertension	$1,423.97
Obesity	$1,487.38
Type 2 diabetes	$2,802.65
Foodborne Illness	$3,004.77
Sub total indirect tangible benefits	**$9,347.59**
Total benefits	**$499,267.96**
Direct costs	
Counties	$743,343.59
State	$82,624.72
Marginal excess burden	$140,414.61
Total costs	**$966,382.92**
Benefit cost ratio	**$0.52/$1.00**
Net present value	**$-467,114.96**

Direct benefits – 50% of graduates practicing optimal nutrition behaviors

Disease/condition: Heart disease (Type A)	
Annual number of graduates in EFNEP	643
Prevalence of heart disease in the population	12.9%
Incidence rate of heart disease related to diet	26.5%
Percent of graduates practicing optimal nutritional behaviors related to heart disease	0.2%
Estimated number of graduates to accrue benefits	0.04
Present value of the benefits related to heart disease	$1,861.53
Total direct benefit of delaying heart disease	**$74.46**

Disease/condition: Stroke (Type A)	
Annual number of graduates in EFNEP	643
Prevalence of stroke in the population	2.7%
Incidence rate of stroke related to diet	26.5%
Percent of graduates practicing optimal nutritional behaviors related to stroke	0.2%
Estimated number of graduates to accrue benefits	0.009
Present value of the benefits related to stroke	$7,253.33
Total direct benefit of delaying stroke	**$65.28**

Disease/condition: Colorectal Cancer (Type A)	
Annual number of graduates in EFNEP	643
Incidence rate of colorectal cancer in the population	5.8%
Incidence rate of colorectal cancer related to diet	35%
Percent of graduates practicing optimal nutritional behaviors related to colorectal cancer	1.0%
Estimated number of graduates to accrue benefits	0.1
Present value of the benefits related to colorectal cancer	$19,352.48
Total direct benefit of delaying colorectal cancer	**$1,935.25**

Direct benefits- 50% of graduates practicing optimal nutrition behaviors, continued

Disease/condition: Hypertension (Type B)	
Annual number of graduates in EFNEP	643
Prevalence rate of hypertension in the population	38.7%
Incidence rate of hypertension related to diet	50%
Percent of graduates practicing optimal nutritional behaviors related to hypertension	0.2%
Estimated number of graduates to accrue benefits	0.2
Present value of the benefits related to hypertension	$3,829.38
Total direct benefit of delaying hypertension	**$765.88**

Disease/condition: Obesity (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of obesity in the population	38.5%
Incidence rate of obesity related to diet	33%
Percent of graduates practicing optimal nutritional behaviors related to obesity	3.8%
Estimated number of graduates to accrue benefits	3.1
Present value of the benefits related to obesity	$7,831.29
Total direct benefit of delaying obesity	**$24,276.99**

Disease/condition: Type 2 diabetes (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of Type 2 diabetes in the population	8.0%
Incidence rate of Type 2 diabetes related to diet	67%
Percent of graduates practicing optimal nutritional behaviors related to Type 2 diabetes	2.6%
Estimated number of graduates to accrue benefits	0.9
Present value of the benefits related to Type 2 diabetes	$64,248.55
Total direct benefit of delaying Type 2 diabetes	**$57,823.70**

Direct benefits- 50% of graduates practicing optimal nutrition behaviors, continued

Disease/condition: Osteoporosis (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of osteoporosis in the population	11.7%
Incidence rate of osteoporosis related to diet	40%
Percent of graduates practicing optimal nutritional behaviors related to osteoporosis	6.7%
Estimated number of graduates to accrue benefits	2.0
Present value of the benefits related to osteoporosis	$123,571.08
Total direct benefit of delaying osteoporosis	**$247,142.16**

Disease/condition: Foodborne Illness (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of foodborne illness in the population	2.8%
Incidence rate of foodborne illness related to diet	100%
Percent of graduates practicing optimal nutritional behaviors related to foodborne illness	21.3%
Estimated number of graduates to accrue benefits	3.8
Present value of the benefits related to foodborne illness	$28,859.50
Total direct benefit of delaying foodborne illness	**$109,661.10**

Disease/condition: Low birth weight (lbw) infants (Type C)	
Annual number of female graduates in EFNEP	608
Incidence rate of lbw infants in the population	7.2%
Incidence rate of lbw infants related to diet	90%
Percent of graduates practicing optimal nutritional behaviors related to low birth weight infants	1.5%
Estimated number of graduates to accrue benefits	0.6
Present value of the benefits related to lbw infants	$80,292.58
Total direct benefit of delaying low birth weight infants	**$48,175.55**

Indirect benefits- 50% of graduates practicing optimal nutrition behaviors

Disease/condition: Heart disease (Type A)	
Average age of onset for heart disease	55
Average delayed onset resulting from EFNEP	60
Average number of annual lost work days	58
Estimated number of graduates to accrue benefits	0.04
Present value of lost earnings for heart disease	$12,171.68
Total indirect benefit of delaying heart disease	**$486.87**

Disease/condition: Stroke (Type A)	
Average age of onset for stroke	55
Average delayed onset resulting from EFNEP	60
Average number of annual lost work days	60
Estimated number of graduates to accrue benefits	0.009
Present value of lost earnings for stroke	$8,431.37
Total indirect benefit of delaying stroke	**$75.88**

Disease/condition: Colorectal Cancer (Type A)	
Average age of onset for colorectal cancer	50
Average delayed onset resulting from EFNEP	66
Average number of annual lost work days	8.8
Estimated number of graduates to accrue benefits	0.1
Present value of lost earnings for colorectal cancer	$660.74
Total indirect benefit of delaying colorectal cancer	**$66.07**

Disease/condition: Hypertension (Type B)	
Average age of onset	50
Average delayed onset resulting from EFNEP	55
Average number of annual lost work days	41
Estimated number of graduates to accrue benefits	0.2
Present value of lost earnings for hypertension	$7,119.87
Total indirect benefit of delaying hypertension	**$1,423.97**

Indirect benefits- 50% of graduates practicing optimal nutrition behaviors, continued

Disease/condition: Obesity (Type B)	
Average age of onset of obesity	45
Average age of retirement	65
Average number of annual lost work days	1.8
Estimated number of graduates to accrue benefits	3.1
Present value of lost earnings for obesity	$479.80
Total indirect benefit of delaying obesity	**$1,487.38**

Disease/condition: Type 2 diabetes (Type B)	
Average age of onset for Type 2 diabetes	40
Average age of retirement	65
Average number of annual lost work days	8.3
Estimated number of graduates to accrue benefits	0.9
Present value of lost earnings for Type 2 diabetes	$3,114.06
Total indirect benefit of delaying Type 2 diabetes	**$2,802.65**

Disease/condition: Foodborne Illness (Type B)	
Average age of onset of foodborne illness	28
Average age of retirement	65
Average number of annual lost work days	1
Estimated number of graduates to accrue benefits	3.8
Present value of lost earnings for foodborne illness	$790.73
Total indirect benefit of delaying foodborne illness	**$3,004.77**

APPENDIX G

EFNEP CBA- 10% discount rate graduates practicing optimal nutrition behaviors

Direct tangible benefits	**Value**
Cardiovascular Disease	$77.39
Stroke	$62.56
Colorectal Cancer	$3,351.23
Hypertension	$530.42
Obesity	$13,585.19
Type 2 diabetes	$39,508.87
Osteoporosis	$165,481.96
Foodborne Illness	$125,506.92
Low birth weight infants	$96,531.10
Sub total direct tangible benefits	**$447,635.64**
Indirect tangible benefits	
Cardiovascular Disease	$506.02
Stroke	$72.72
Colorectal Cancer	$114.42
Hypertension	$1,160.98
Obesity	$953.25
Type 2 diabetes	$2,051.26
Foodborne Illness	$3,679.98
Sub total indirect tangible benefits	**$8.538.63**
Total benefits	**$456,174.27**
Direct costs	
Counties	$743,343.59
State	$82,624.72
Marginal excess burden	$140,414.61
Total costs	**$966,382.92**
Benefit cost ratio	**$0.47/$1.00**
Net present value	**$-510,208.65**

Direct benefits- 10% discount rate for graduates practicing optimal nutrition behaviors

Disease/condition: Heart disease (Type A)	
Annual number of graduates in EFNEP	643
Prevalence of heart disease in the population	12.9%
Incidence rate of heart disease related to diet	26.5%
Percent of graduates practicing optimal nutritional behaviors related to heart disease	0.5%
Estimated number of graduates to accrue benefits	0.1
Present value of the benefits related to heart disease	$773.93
Total direct benefit of delaying heart disease	**$77.39**

Disease/condition: Stroke (Type A)	
Annual number of graduates in EFNEP	643
Prevalence of stroke in the population	2.7%
Incidence rate of stroke related to diet	26.5%
Percent of graduates practicing optimal nutritional behaviors related to stroke	0.5%
Estimated number of graduates to accrue benefits	0.02
Present value of the benefits related to stroke	$3,127.90
Total direct benefit of delaying stroke	**$62.56**

Disease/condition: Colorectal Cancer (Type A)	
Annual number of graduates in EFNEP	643
Incidence rate of colorectal cancer in the population	5.8%
Incidence rate of colorectal cancer related to diet	35%
Percent of graduates practicing optimal nutritional behaviors related to colorectal cancer	2.0%
Estimated number of graduates to accrue benefits	0.3
Present value of the benefits related to colorectal cancer	$11,170.78
Total direct benefit of delaying colorectal cancer	**$3,351.23**

Direct benefits- 10% discount rate for graduates practicing optimal nutrition behaviors, continued

Disease/condition: Hypertension (Type B)	
Annual number of graduates in EFNEP	643
Prevalence rate of hypertension in the population	38.7%
Incidence rate of hypertension related to diet	50%
Percent of graduates practicing optimal nutritional behaviors related to hypertension	0.5%
Estimated number of graduates to accrue benefits	0.6
Present value of the benefits related to hypertension	$884.04
Total direct benefit of delaying hypertension	**$530.42**

Disease/condition: Obesity (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of obesity in the population	38.5%
Incidence rate of obesity related to diet	33%
Percent of graduates practicing optimal nutritional behaviors related to obesity	7.6%
Estimated number of graduates to accrue benefits	6.2
Present value of the benefits related to obesity	$2,191.16
Total direct benefit of delaying obesity	**$13,585.19**

Disease/condition: Type 2 diabetes (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of Type 2 diabetes in the population	8.0%
Incidence rate of Type 2 diabetes related to diet	67%
Percent of graduates practicing optimal nutritional behaviors related to Type 2 diabetes	5.1%
Estimated number of graduates to accrue benefits	1.8
Present value of the benefits related to Type 2 diabetes	$21,949.37
Total direct benefit of delaying Type 2 diabetes	**$39,508.87**

Direct benefits- 10% discount rate for graduates practicing optimal nutrition behaviors, continued

Disease/condition: Osteoporosis (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of osteoporosis in the population	11.7%
Incidence rate of osteoporosis related to diet	40%
Percent of graduates practicing optimal nutritional behaviors related to osteoporosis	13.4%
Estimated number of graduates to accrue benefits	4.0
Present value of the benefits related to osteoporosis	$41,370.49
Total direct benefit of delaying osteoporosis	**$165,481.96**

Disease/condition: Foodborne Illness (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of foodborne illness in the population	2.8%
Incidence rate of foodborne illness related to diet	100%
Percent of graduates practicing optimal nutritional behaviors related to foodborne illness	42.5%
Estimated number of graduates to accrue benefits	7.7
Present value of the benefits related to foodborne illness	$16,299.60
Total direct benefit of delaying foodborne illness	**$125,506.92**

Disease/condition: Low birth weight (lbw) infants (Type C)	
Annual number of female graduates in EFNEP	608
Incidence rate of lbw infants in the population	7.2%
Incidence rate of lbw infants related to diet	90%
Percent of graduates practicing optimal nutritional behaviors related to low birth weight infants	3.0%
Estimated number of graduates to accrue benefits	1.2
Present value of the benefits related to lbw infants	$80,292.58
Total direct benefit of delaying low birth weight infants	**$96,351.10**

Indirect benefits- 10% discount rate for graduates practicing optimal nutrition behaviors

Disease/condition: Heart disease (Type A)	
Average age of onset for heart disease	55
Average delayed onset resulting from EFNEP	60
Average number of annual lost work days	58
Estimated number of graduates to accrue benefits	0.1
Present value of lost earnings for heart disease	$5060.15
Total indirect benefit of delaying heart disease	**$506.02**

Disease/condition: Stroke (Type A)	
Average age of onset for stroke	55
Average delayed onset resulting from EFNEP	60
Average number of annual lost work days	60
Estimated number of graduates to accrue benefits	0.02
Present value of lost earnings for stroke	$3,635.91
Total indirect benefit of delaying stroke	**$72.72**

Disease/condition: Colorectal Cancer (Type A)	
Average age of onset for colorectal cancer	50
Average delayed onset resulting from EFNEP	66
Average number of annual lost work days	8.8
Estimated number of graduates to accrue benefits	0.3
Present value of lost earnings for colorectal cancer	$381.40
Total indirect benefit of delaying colorectal cancer	**$114.42**

Disease/condition: Hypertension (Type B)	
Average age of onset	50
Average delayed onset resulting from EFNEP	55
Average number of annual lost work days	41
Estimated number of graduates to accrue benefits	0.6
Present value of lost earnings for hypertension	$1,934.97
Total indirect benefit of delaying hypertension	**$1,160.98**

Indirect benefits- 10% discount rate for graduates practicing optimal nutrition behaviors, continued

Disease/condition: Obesity (Type B)	
Average age of onset of obesity	45
Average age of retirement	65
Average number of annual lost work days	1.8
Estimated number of graduates to accrue benefits	6.2
Present value of lost earnings for obesity	$153.75
Total indirect benefit of delaying obesity	**$953.25**

Disease/condition: Type 2 diabetes (Type B)	
Average age of onset for Type 2 diabetes	40
Average age of retirement	65
Average number of annual lost work days	8.3
Estimated number of graduates to accrue benefits	1.8
Present value of lost earnings for Type 2 diabetes	$1,139.59
Total indirect benefit of delaying Type 2 diabetes	**$2,051.26**

Disease/condition: Foodborne Illness (Type B)	
A) Average age of onset of foodborne illness	28
B) Average age of retirement	65
C) Average number of annual lost work days	1
D) Estimated number of graduates to accrue benefits	7.7
E) Present value of lost earnings for foodborne illness	$477.92
Total indirect benefit of delaying foodborne illness	**$3,679.98**

APPENDIX H

EFNEP CBA- 75% of graduates showing improvements of optimal nutrition behaviors

Direct tangible benefits	**Value**
Cardiovascular Disease	$558.46
Stroke	$435.20
Colorectal Cancer	$5,805.74
Hypertension	$6,509.95
Obesity	$20,361.35
Type 2 diabetes	$128,497.10
Osteoporosis	$506,641.43
Foodborne Illness	$95,236.35
Low birth weight infants	$120,438.87
Sub total direct tangible benefits	**$884,484.45**
Indirect tangible benefits	
Cardiovascular Disease	$3,651.50
Stroke	$505.88
Colorectal Cancer	$198.22
Hypertension	$12,103.78
Obesity	$1,247.48
Type 2 diabetes	$6,228.12
Foodborne Illness	$2,609.41
Sub total indirect tangible benefits	**$26,544.39**
Total benefits	**$911,028.84**
Direct costs	
Counties	$743,343.59
State	$82,624.72
Marginal excess burden	$140,414.61
Total costs	**$966,382.92**
Benefit cost ratio	**$0.94/$1.00**
Net present value	**$-55,354.08**

Direct benefits- 75% of graduates improving optimal nutrition behaviors

Disease/condition: Heart disease (Type A)	
Annual number of graduates in EFNEP	643
Prevalence of heart disease in the population	12.9%
Incidence rate of heart disease related to diet	26.5%
Percent of graduates improving optimal nutritional behaviors related to heart disease	1.4%
Estimated number of graduates to accrue benefits	0.3
Present value of the benefits related to heart disease	$1,861.53
Total direct benefit of delaying heart disease	**$558.46**

Disease/condition: Stroke (Type A)	
Annual number of graduates in EFNEP	643
Prevalence of stroke in the population	2.7%
Incidence rate of stroke related to diet	26.5%
Percent of graduates improving optimal nutritional behaviors related to stroke	1.4%
Estimated number of graduates to accrue benefits	0.06
Present value of the benefits related to stroke	$7,253.33
Total direct benefit of delaying stroke	**$435.20**

Disease/condition: Colorectal Cancer (Type A)	
Annual number of graduates in EFNEP	643
Incidence rate of colorectal cancer in the population	5.8%
Incidence rate of colorectal cancer related to diet	35%
Percent of graduates improving optimal nutritional behaviors related to colorectal cancer	2.5%
Estimated number of graduates to accrue benefits	0.3
Present value of the benefits related to colorectal cancer	$19,352.48
Total direct benefit of delaying colorectal cancer	**$5,805.74**

Direct benefits- 75% of graduates improving optimal nutrition behaviors, continued

Disease/condition: Hypertension (Type B)	
Annual number of graduates in EFNEP	643
Prevalence rate of hypertension in the population	38.7%
Incidence rate of hypertension related to diet	50%
Percent of graduates improving optimal nutritional behaviors related to hypertension	1.4%
Estimated number of graduates to accrue benefits	1.7
Present value of the benefits related to hypertension	$3,829.38
Total direct benefit of delaying hypertension	**$6,509.95**

Disease/condition: Obesity (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of obesity in the population	38.5%
Incidence rate of obesity related to diet	33%
Percent of graduates improving optimal nutritional behaviors related to obesity	3.2%
Estimated number of graduates to accrue benefits	2.6
Present value of the benefits related to obesity	$7,831.29
Total direct benefit of delaying obesity	**$20,361.35**

Disease/condition: Type 2 diabetes (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of Type 2 diabetes in the population	8.0%
Incidence rate of Type 2 diabetes related to diet	67%
Percent of graduates improving optimal nutritional behaviors related to Type 2 diabetes	5.7%
Estimated number of graduates to accrue benefits	2.0
Present value of the benefits related to Type 2 diabetes	$64,248.55
Total direct benefit of delaying Type 2 diabetes	**$128,497.10**

Direct benefits- 75% of graduates improving optimal nutrition behaviors, continued

Disease/condition: Osteoporosis (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of osteoporosis in the population	11.7%
Incidence rate of osteoporosis related to diet	40%
Percent of graduates improving optimal nutritional behaviors related to osteoporosis	13.7%
Estimated number of graduates to accrue benefits	4.1
Present value of the benefits related to osteoporosis	$123,571.08
Total direct benefit of delaying osteoporosis	**$506,641.43**

Disease/condition: Foodborne Illness (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of foodborne illness in the population	2.8%
Incidence rate of foodborne illness related to diet	100%
Percent of graduates improving optimal nutritional behaviors related to foodborne illness	18.3%
Estimated number of graduates to accrue benefits	3.3
Present value of the benefits related to foodborne illness	$28,859.50
Total direct benefit of delaying foodborne illness	**$95,236.35**

Disease/condition: Low birth weight (lbw) infants (Type C)	
Annual number of female graduates in EFNEP	608
Incidence rate of lbw infants in the population	7.2%
Incidence rate of lbw infants related to diet	90%
Percent of graduates improving optimal nutritional behaviors related to low birth weight infants	3.7%
Estimated number of graduates to accrue benefits	1.5
Present value of the benefits related to lbw infants	$80,292.58
Total direct benefit of delaying low birth weight infants	**$120,438.87**

Indirect benefits- 75% of graduates improving optimal nutrition behaviors

Disease/condition: Heart disease (Type A)	
Average age of onset for heart disease	55
Average delayed onset resulting from EFNEP	60
Average number of annual lost work days	58
Estimated number of graduates to accrue benefits	0.3
Present value of lost earnings for heart disease	$12,171.68
Total indirect benefit of delaying heart disease	**$3,651.50**

Disease/condition: Stroke (Type A)	
Average age of onset for stroke	55
Average delayed onset resulting from EFNEP	60
Average number of annual lost work days	60
Estimated number of graduates to accrue benefits	0.06
Present value of lost earnings for stroke	$8,431.37
Total indirect benefit of delaying stroke	**$505.88**

Disease/condition: Colorectal Cancer (Type A)	
Average age of onset for colorectal cancer	50
Average delayed onset resulting from EFNEP	66
Average number of annual lost work days	8.8
Estimated number of graduates to accrue benefits	0.3
Present value of lost earnings for colorectal cancer	$660.74
Total indirect benefit of delaying colorectal cancer	**$198.22**

Disease/condition: Hypertension (Type B)	
Average age of onset	50
Average delayed onset resulting from EFNEP	55
Average number of annual lost work days	41
Estimated number of graduates to accrue benefits	1.7
Present value of lost earnings for hypertension	$7,119.87
Total indirect benefit of delaying hypertension	**$12,103.78**

Indirect benefits- 75% of graduates improving optimal nutrition behaviors, continued

Disease/condition: Obesity (Type B)	
Average age of onset of obesity	45
Average age of retirement	65
Average number of annual lost work days	1.8
Estimated number of graduates to accrue benefits	2.6
Present value of lost earnings for obesity	$479.80
Total indirect benefit of delaying obesity	**$1,247.48**

Disease/condition: Type 2 diabetes (Type B)	
Average age of onset for Type 2 diabetes	40
Average age of retirement	65
Average number of annual lost work days	8.3
Estimated number of graduates to accrue benefits	2.0
Present value of lost earnings for Type 2 diabetes	$3,114.06
Total indirect benefit of delaying Type 2 diabetes	**$6,228.12**

Disease/condition: Foodborne Illness (Type B)	
Average age of onset of foodborne illness	28
Average age of retirement	65
Average number of annual lost work days	1
Estimated number of graduates to accrue benefits	3.3
Present value of lost earnings for foodborne illness	$790.73
Total indirect benefit of delaying foodborne illness	**$2,609.41**

APPENDIX I

EFNEP CBA- 50% of graduates showing improvements of optimal nutrition behaviors

Direct tangible benefits	**Value**
Cardiovascular Disease	$372.31
Stroke	$290.13
Colorectal Cancer	$3,870.50
Hypertension	$4,212.32
Obesity	$13,313.19
Type 2 diabetes	$83,523.12
Osteoporosis	$328,241.92
Foodborne Illness	$63,490.90
Low birth weight infants	$80,292.58
Sub total direct tangible benefits	**$577,606.97**
Indirect tangible benefits	
Cardiovascular Disease	$2,434.34
Stroke	$337.25
Colorectal Cancer	$132.15
Hypertension	$7,831.86
Obesity	$815.66
Type 2 diabetes	$4,048.28
Foodborne Illness	$1,739.61
Sub total indirect tangible benefits	**$17,339.15**
Total benefits	**$594,946.12**
Direct costs	
Counties	$743,343.59
State	$82,624.72
Marginal excess burden	$140,414.61
Total costs	**$966,382.92**
Benefit cost ratio	**$0.62/$1.00**
Net present value	**$-371,436.80**

Direct benefits- 50% of graduates improving optimal nutrition behaviors

Disease/condition: Heart disease (Type A)	
Annual number of graduates in EFNEP	643
Prevalence of heart disease in the population	12.9%
Incidence rate of heart disease related to diet	26.5%
Percent of graduates improving optimal nutritional behaviors related to heart disease	0.9%
Estimated number of graduates to accrue benefits	0.2
Present value of the benefits related to heart disease	$1,861.53
Total direct benefit of delaying heart disease	**$372.31**

Disease/condition: Stroke (Type A)	
Annual number of graduates in EFNEP	643
Prevalence of stroke in the population	2.7%
Incidence rate of stroke related to diet	26.5%
Percent of graduates improving optimal nutritional behaviors related to stroke	0.9%
Estimated number of graduates to accrue benefits	0.04
Present value of the benefits related to stroke	$7,253.33
Total direct benefit of delaying stroke	**$290.13**

Disease/condition: Colorectal Cancer (Type A)	
Annual number of graduates in EFNEP	643
Incidence rate of colorectal cancer in the population	5.8%
Incidence rate of colorectal cancer related to diet	35%
Percent of graduates improving optimal nutritional behaviors related to colorectal cancer	1.7%
Estimated number of graduates to accrue benefits	0.2
Present value of the benefits related to colorectal cancer	$19,352.48
Total direct benefit of delaying colorectal cancer	**$3,870.50**

Direct benefits- 50% of graduates improving optimal nutrition behaviors, continued

Disease/condition: Hypertension (Type B)	
Annual number of graduates in EFNEP	643
Prevalence rate of hypertension in the population	38.7%
Incidence rate of hypertension related to diet	50%
Percent of graduates improving optimal nutritional behaviors related to hypertension	1.1%
Estimated number of graduates to accrue benefits	1.1
Present value of the benefits related to hypertension	$3,829.38
Total direct benefit of delaying hypertension	**$4,212.32**

Disease/condition: Obesity (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of obesity in the population	38.5%
Incidence rate of obesity related to diet	33%
Percent of graduates improving optimal nutritional behaviors related to obesity	2.1%
Estimated number of graduates to accrue benefits	1.7
Present value of the benefits related to obesity	$7,831.29
Total direct benefit of delaying obesity	**$13,313.19**

Disease/condition: Type 2 diabetes (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of Type 2 diabetes in the population	8.0%
Incidence rate of Type 2 diabetes reiated to diet	67%
Percent of graduates improving optimal nutritional behaviors related to Type 2 diabetes	3.8%
Estimated number of graduates to accrue benefits	1.3
Present value of the benefits related to Type 2 diabetes	$64,248.55
Total direct benefit of delaying Type 2 diabetes	**$83,523.12**

Direct benefits- 50% of graduates improving optimal nutrition behaviors, continued

Disease/condition: Osteoporosis (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of osteoporosis in the population	11.7%
Incidence rate of osteoporosis related to diet	40%
Percent of graduates improving optimal nutritional behaviors related to osteoporosis	9.1%
Estimated number of graduates to accrue benefits	2.7
Present value of the benefits related to osteoporosis	$123,571.08
Total direct benefit of delaying osteoporosis	**$328,241.92**

Disease/condition: Foodborne Illness (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of foodborne illness in the population	2.8%
Incidence rate of foodborne illness related to diet	100%
Percent of graduates improving optimal nutritional behaviors related to foodborne illness	12.2%
Estimated number of graduates to accrue benefits	2.2
Present value of the benefits related to foodborne illness	$28,859.50
Total direct benefit of delaying foodborne illness	**$63,490.90**

Disease/condition: Low birth weight (lbw) infants (Type C)	
Annual number of female graduates in EFNEP	608
Incidence rate of lbw infants in the population	7.2%
Incidence rate of lbw infants related to diet	90%
Percent of graduates improving optimal nutritional behaviors related to low birth weight infants	2.5%
Estimated number of graduates to accrue benefits	1.0
Present value of the benefits related to lbw infants	$80,292.58
Total direct benefit of delaying low birth weight infants	**$80,292.58**

Indirect benefits- 50% of graduates improving optimal nutrition behaviors

Disease/condition: Heart disease (Type A)	
Average age of onset for heart disease	55
Average delayed onset resulting from EFNEP	60
Average number of annual lost work days	58
Estimated number of graduates to accrue benefits	0.2
Present value of lost earnings for heart disease	$12,171.68
Total indirect benefit of delaying heart disease	**$2,434.34**

Disease/condition: Stroke (Type A)	
Average age of onset for stroke	55
Average delayed onset resulting from EFNEP	60
Average number of annual lost work days	60
Estimated number of graduates to accrue benefits	0.04
Present value of lost earnings for stroke	$8,431.37
Total indirect benefit of delaying stroke	**$337.25**

Disease/condition: Colorectal Cancer (Type A)	
Average age of onset for colorectal cancer	50
Average delayed onset resulting from EFNEP	66
Average number of annual lost work days	8.8
Estimated number of graduates to accrue benefits	0.2
Present value of lost earnings for colorectal cancer	$660.74
Total indirect benefit of delaying colorectal cancer	**$132.15**

Disease/condition: Hypertension (Type B)	
Average age of onset	50
Average delayed onset resulting from EFNEP	55
Average number of annual lost work days	41
Estimated number of graduates to accrue benefits	1.1
Present value of lost earnings for hypertension	$7,119.87
Total indirect benefit of delaying hypertension	**$7,831.86**

Indirect benefits- 50% of graduates improving optimal nutrition behaviors, continued

Disease/condition: Obesity (Type B)	
Average age of onset of obesity	45
Average age of retirement	65
Average number of annual lost work days	1.8
Estimated number of graduates to accrue benefits	1.7
Present value of lost earnings for obesity	$479.80
Total indirect benefit of delaying obesity	**$815.66**

Disease/condition: Type 2 diabetes (Type B)	
Average age of onset for Type 2 diabetes	40
Average age of retirement	65
Average number of annual lost work days	8.3
Estimated number of graduates to accrue benefits	1.3
Present value of lost earnings for Type 2 diabetes	$3,114.06
Total indirect benefit of delaying Type 2 diabetes	**$4,048.28**

Disease/condition: Foodborne Illness (Type B)	
Average age of onset of foodborne illness	28
Average age of retirement	65
Average number of annual lost work days	1
Estimated number of graduates to accrue benefits	2.2
Present value of lost earnings for foodborne illness	$790.73
Total indirect benefit of delaying foodborne Illness	**$1,739.61**

APPENDIX J

EFNEP CBA- 10% discount rate graduates improving optimal nutrition behaviors

Direct tangible benefits	**Value**
Cardiovascular Disease	$309.57
Stroke	$281.51
Colorectal Cancer	$4,468.31
Hypertension	$353.62
Obesity	$7,449.94
Type 2 diabetes	$57,068.36
Osteoporosis	$227,537.70
Foodborne Illness	$71,718.24
Low birth weight infants	$152,555.90
Sub total direct tangible benefits	**$521,743.15**
Indirect tangible benefits	
Cardiovascular Disease	$2,024.06
Stroke	$327.24
Colorectal Cancer	$152.56
Hypertension	$4,643.93
Obesity	$522.75
Type 2 diabetes	$2,962.93
Foodborne Illness	$2,102.85
Sub total indirect tangible benefits	**$12,736.29**
Total benefits	**$534,479.44**
Direct costs	
Counties	$743,343.59
State	$82,624.72
Marginal excess burden	$140,414.61
Total costs	**$966,382.92**
Benefit cost ratio	**$0.55/$1.00**
Net present value	**$-431,903.45**

Direct benefits- 10% discount rate for graduates improving optimal nutrition behaviors

Disease/condition: Heart disease (Type A)	
Annual number of graduates in EFNEP	643
Prevalence of heart disease in the population	12.9%
Incidence rate of heart disease related to diet	26.5%
Percent of graduates improving optimal nutritional behaviors related to heart disease	1.9%
Estimated number of graduates to accrue benefits	0.4
Present value of the benefits related to heart disease	$773.93
Total direct benefit of delaying heart disease	**$309.57**

Disease/condition: Stroke (Type A)	
Annual number of graduates in EFNEP	643
Prevalence of stroke in the population	2.7%
Incidence rate of stroke related to diet	26.5%
Percent of graduates improving optimal nutritional behaviors related to stroke	1.9%
Estimated number of graduates to accrue benefits	0.09
Present value of the benefits related to stroke	$3,127.90
Total direct benefit of delaying stroke	**$281.51**

Disease/condition: Colorectal Cancer (Type A)	
Annual number of graduates in EFNEP	643
Incidence rate of colorectal cancer in the population	5.8%
Incidence rate of colorectal cancer related to diet	35%
Percent of graduates improving optimal nutritional behaviors related to colorectal cancer	3.3%
Estimated number of graduates to accrue benefits	0.4
Present value of the benefits related to colorectal cancer	$11,170.78
Total direct benefit of delaying colorectal cancer	**$4,468.31**

Direct benefits- 10% discount rate for graduates improving optimal nutrition behaviors, continued

Disease/condition: Hypertension (Type B)	
Annual number of graduates in EFNEP	643
Prevalence rate of hypertension in the population	38.7%
Incidence rate of hypertension related to diet	50%
Percent of graduates improving optimal nutritional behaviors related to hypertension	1.9%
Estimated number of graduates to accrue benefits	2.4
Present value of the benefits related to hypertension	$884.04
Total direct benefit of delaying hypertension	**$353.62**

Disease/condition: Obesity (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of obesity in the population	38.5%
Incidence rate of obesity related to diet	33%
Percent of graduates improving optimal nutritional behaviors related to obesity	4.2%
Estimated number of graduates to accrue benefits	3.4
Present value of the benefits related to obesity	$2,191.16
Total direct benefit of delaying obesity	**$7,449.94**

Disease/condition: Type 2 diabetes (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of Type 2 diabetes in the population	8.0%
Incidence rate of Type 2 diabetes related to diet	67%
Percent of graduates improving optimal nutritional behaviors related to Type 2 diabetes	7.6%
Estimated number of graduates to accrue benefits	2.6
Present value of the benefits related to Type 2 diabetes	$21,949.37
Total direct benefit of delaying Type 2 diabetes	**$57,068.36**

Direct benefits- 10% discount rate for graduates improving optimal nutrition behaviors, continued

Disease/condition: Osteoporosis (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of osteoporosis in the population	11.7%
Incidence rate of osteoporosis related to diet	40%
Percent of graduates improving optimal nutritional behaviors related to osteoporosis	18.2%
Estimated number of graduates to accrue benefits	5.5
Present value of the benefits related to osteoporosis	$41,370.49
Total direct benefit of delaying osteoporosis	**$227,537.70**

Disease/condition: Foodborne Illness (Type B)	
Annual number of graduates in EFNEP	643
Prevalence of foodborne illness in the population	2.8%
Incidence rate of foodborne illness related to diet	100%
Percent of graduates improving optimal nutritional behaviors related to foodborne illness	24.4%
Estimated number of graduates to accrue benefits	4.4
Present value of the benefits related to foodborne illness	$16,299.60
Total direct benefit of delaying foodborne illness	**$71,718.24**

Disease/condition: Low birth weight (lbw) infants (Type C)	
Annual number of female graduates in EFNEP	608
Incidence rate of lbw infants in the population	7.2%
Incidence rate of lbw infants related to diet	90%
Percent of graduates improving optimal nutritional behaviors related to low birth weight infants	4.9%
Estimated number of graduates to accrue benefits	1.9
Present value of the benefits related to lbw infants	$80,292.58
Total direct benefit of delaying low birth weight infants	**$152,555.90**

Indirect benefits-10% discount rate for graduates improving optimal nutrition behaviors

Disease/condition: Heart disease (Type A)	
Average age of onset for heart disease	55
Average delayed onset resulting from EFNEP	60
Average number of annual lost work days	58
Estimated number of graduates to accrue benefits	0.4
Present value of lost earnings for heart disease	$5,060.15
Total indirect benefit of delaying heart disease	**$2,024.06**

Disease/condition: Stroke (Type A)	
Average age of onset for stroke	55
Average delayed onset resulting from EFNEP	60
Average number of annual lost work days	60
Estimated number of graduates to accrue benefits	0.09
Present value of lost earnings for stroke	$3,635.91
Total indirect benefit of delaying stroke	**$327.24**

Disease/condition: Colorectal Cancer (Type A)	
Average age of onset for colorectal cancer	50
Average delayed onset resulting from EFNEP	66
Average number of annual lost work days	8.8
Estimated number of graduates to accrue benefits	0.4
Present value of lost earnings for colorectal cancer	$381.40
Total indirect benefit of delaying colorectal cancer	**$152.56**

Disease/condition: Hypertension (Type B)	
Average age of onset	50
Average delayed onset resulting from EFNEP	55
Average number of annual lost work days	41
Estimated number of graduates to accrue benefits	2.4
Present value of lost earnings for hypertension	$1,934.97
Total indirect benefit of delaying hypertension	**$4,643.93**

Indirect benefits-10% discount rate for graduates improving optimal nutrition behaviors

Disease/condition: Heart disease (Type A)	
Average age of onset for heart disease	55
Average delayed onset resulting from EFNEP	60
Average number of annual lost work days	58
Estimated number of graduates to accrue benefits	0.4
Present value of lost earnings for heart disease	$5,060.15
Total indirect benefit of delaying heart disease	**$2,024.06**

Disease/condition: Stroke (Type A)	
Average age of onset for stroke	55
Average delayed onset resulting from EFNEP	60
Average number of annual lost work days	60
Estimated number of graduates to accrue benefits	0.09
Present value of lost earnings for stroke	$3,635.91
Total indirect benefit of delaying stroke	**$327.24**

Disease/condition: Colorectal Cancer (Type A)	
Average age of onset for colorectal cancer	50
Average delayed onset resulting from EFNEP	66
Average number of annual lost work days	8.8
Estimated number of graduates to accrue benefits	0.4
Present value of lost earnings for colorectal cancer	$381.40
Total indirect benefit of delaying colorectal cancer	**$152.56**

Disease/condition: Hypertension (Type B)	
Average age of onset	50
Average delayed onset resulting from EFNEP	55
Average number of annual lost work days	41
Estimated number of graduates to accrue benefits	2.4
Present value of lost earnings for hypertension	$1,934.97
Total indirect benefit of delaying hypertension	**$4,643.93**

Indirect benefits- 10% discount rate for graduates improving optimal nutrition behaviors, continued

Disease/condition: Obesity (Type B)	
Average age of onset of obesity	45
Average age of retirement	65
Average number of annual lost work days	1.8
Estimated number of graduates to accrue benefits	3.4
Present value of lost earnings for obesity	$153.75
Total indirect benefit of delaying obesity	**$522.75**

Disease/condition: Type 2 diabetes (Type B)	
Average age of onset for Type 2 diabetes	40
Average age of retirement	65
Average number of annual lost work days	8.3
Estimated number of graduates to accrue benefits	2.6
Present value of lost earnings for Type 2 diabetes	$1,139.59
Total indirect benefit of delaying Type 2 diabetes	**$2,962.93**

Disease/condition: Foodborne Illness (Type B)	
Average age of onset of foodborne illness	28
Average age of retirement	65
Average number of annual lost work days	1
Estimated number of graduates to accrue benefits	4.4
Present value of lost earnings for foodborne illness	$477.92
Total indirect benefit of delaying foodborne illness	**$2,102.85**

VITA

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